SECRETS OF RADAR GIVEN TO WORLD

Its Role in War and Uses for Peacetime Revealed in Washington and London

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WASHINGTON, Aug. 14—The great drama of radar, the war's most powerful "secret weapon" until the atomic bomb was devised, was displayed before a world audience today.

The Joint Board on Scientific Information Policy permitted the Office of Scientific Research and Development, the War Department and the Navy Department to tell the story of a device of which millions had known vaguely for two years, a device which at least three times stood between survival or defeat by the Axis powers for the United States and Great Britain.

It was radar, short for "radio detection and range," that helped the small surviving British air squadrons to beat the German blitz of 1940, thus not only saving the home islands but preserving them as the essential Anglo-American base from which the continental invasion went forward on June 6, 1944.

It was radar, which "sees through the heaviest fog and the blackest night," that more than any other factor broke in 1942 the German submarine attack in the Atlantic which was threatening to starve and strangle the British homeland.

And it was radar that permitted the remnants of the blasted United States Pacific Fleet to stay alive

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and aggressive after Pearl Harbor.

Radar has been "most secret" to the British and "top secret" to the United States armed forces. President Truman, when in Potsdam, personally authorized the veil to be lifted so far as this country is concerned. The British were understood to have wanted to give out the information some time ago.

Radar sets vary enormously in shape and size, depending on whether they are great installations on the ground, very heavy mechanisms in ships of the line, or the small, box-like objects used in planes. But the principle of all is the same. It is the principle of an "echoing" or "bouncing" electrical impulse.

The characteristic radar transmitter, revolving full circle like a tilted drum, casts out electrical pulses. When these pulses hit something, a built-up area on the ground, a plane in the sky or a ship on the sea, they bounce back. In this return they enter the radar receiver and form images, or "pips" on a screen-like device, much like the face of a faintly illuminated clock that is called the "scope."

Range is determined by this rule: The elapsed time is measured in millionths of seconds between the throwing out of the pulse and its "echo." The pulse travels at the speed of light, or 186,000 miles a second. Thus, an object one thousand yards from the radar will give its echo six-millionths of a second later. On a working set, range is readily indicated by the marked circle on the "scope" or panel in which the target image or "pip" comes to rest.

As to the precise direction in which a target lies, this is determined by a directional antenna which throws out its "pulses" in a narrow band of beams, like a searchlight, while rotating. The "pip" comes up on the "scope" when the antenna is pointed toward the target; comes up very strongly when the beam is dead on the target.

In the long process of briefing laymen in radar, correspondents were flown by the Army to the parent radar training school of the Army Air Forces Training Command at Boca Raton, Fla., and there made flights in Flying Fortresses mounted with the most modern radar instruments.

Scientists in the Naval Research Laboratory are thinking in apparently serious terms of a radar range to the moon. At the moment, good observation from air-borne radar at well over 100 miles is common. At sea, radar's searching eye is limited to the horizon, for the "pulses" have nothing from which to bounce when they reach a curve in the earth's surface.

Developed Abroad, Too

The device was developed in a number of countries at about the same time — the United States, England, France, Germany and perhaps in Japan though on a much less efficient line — but the equipment was never produced on a large scale until the war came. The British sent a delegation here in 1940 to consult American scientists and since then both countries have been exchanging their discoveries. At that time, says Rear Admiral Harold G. Bowen, Chief of the Navy's Office of Research and Inventions, "the British were ahead of us in airborne radar, and we had the edge on them in surface radar."

Dr. Albert Hoyt Taylor, Chief Consultant and Chief Coordinator for Electronics at the Naval Research Laboratory and a "father" of radar, who began work on it in 1922, told correspondents that radar was not an "invention." "Rather," he explained, "it is development, just as broadcasting is a development. Thousands of peoples have played their parts. And as one of my British friends remarked to me, there is plenty of credit in it to go around."

Admiral Bowen, former Commandant of the Naval Research Laboratory, declared that radar's peacetime applications would create "a billion-dollar industry" or bigger. Dr. Taylor agreed that it would be useful in making air and sea travel much safer, because a pilot in sky or sea could always know where his craft was in relations to every other craft or object of possible collision.

Patent Struggle Coming

The Navy and other sources disclosed that one of the great patent struggles of history is likely to break out in the immediate future, both in this country and in Britain, over the commercial use of radar. The United States Government, through Navy and Army research, which has been the great propelling force in all radar development in this country, owns a vast number of patents.

Others are held in one degree or another by commercial firms and by individuals whose rights are assigned to the Government.

As long ago as six months, about $2,700,000,000 of radar equipment had been delivered to the Army and Navy, independent of the enormous expenditures in other countries. Radar is declared to have helped make the electronics industry comparable in size to the pre-war automobile industry.

As for airplanes the radar altimeter infallibly shows the absolute altitude of a plane rather than its mere barometric altitude. This device, if properly used, Army officers pointed out, would have prevented the recent crash of a bomber into the Empire State Building in New York City.

Another development, which the commercial airlines are expected to put almost immediately into widespread use, is what the Army calls "ground approach control." In this case the radar mechanism is carried in an enclosed trailer drawn by a heavy truck. Set up near a landing field which is wholly closed in, say, by fog, this device will "pick up" on its "scope" an incoming plane from five to thirty miles out, line it up precisely with the runway and "talk it in" to a blind but wholly safe landing.

The availability of plenty of personnel to set up, operate and maintain the thousands of new radar gadgets which will be coming out of the factories seems assured, for many thousands of young men have been trained in the services in this field of electronics. In the five radar schools of the Army Training Command 23,175 radar courses were completed by students during the first six months of this year.

Here are some of the previously untold stories of what radar did in crises of the war:

In August of 1940, when the Germans were throwing their bombers at England, the British were able to keep on the ground until the last essential minute their surviving fighters, because a great chain of ground radar installations picked up the German planes as they rose from the Continent and outlined them upon the "scopes" through every obscuring factor of weather and night.

On Sept. 15 of that year, ground and aircraft interception radar, working together, helped to smash 185 of the 500 German attacking craft that came over. When the Luftwaffe staggered back across the Channel that day, it was the hour of defeat for the blitz. The Germans shifted over to night attacks, but radar knows no night and no day, and the enemy never again had England by the throat.

On D-day, June 6, 1944, the Eighth went up at dawn from British bases and hit solid cloud-banks all across the Channel. But the far shoreline and the Jerry gun positions just beyond stood out clearly on the radar "scopes" and the airmen were able to put down for thirty minutes before the hour of the first infantry landing on the beach a rolling bomb barrage that momentarily paralyzed many of the German defenses.

Every bomb that fell was aimed by radar, and not a single Allied soldier was killed by American bomb fire in spite of the fact that the Allied lines and the enemy lines were as close together, as the doughboys put it, as "a quarter after three." In the Channel at the same time big ships of the line were doing some incredible shooting by radar.

When Germany began sending buzz bombs aaginst England last year radar plotted the "doodlebugs" so accurately as to backtrack them to the French coast and lay bare the areas of their launching sites. When the weather was foul, as it often was, there was no defense except ground fire, but this was radar controlled, and the gunners shot "pips" from their scopes by the hundreds: that is, buzz bombs from the sky.

This German "secret weapon," which at the time was almost as revolutionary in the sense of the defender's tactical problem as is the atomic bomb of today, was beaten by radar. On a Sunday in August the Germans sent 105 buzz bombs across the Channel but only three arrived.

Nemesis of Submarine

But radar perhaps played its most dramatic role as the nemesis of the submarine. In 1942 German submarines were sinking Allied shipping at the rate of 16,000 tons a day. When the U-boats came to the surface, they were picked up by radar, and destroyers, corvettes and patrolling planes told of their whereabouts.

The Germans, making use of some captured British equipment, set up a counter-measure in the form of a receiver which had the effect of detecting the distant presence of an Allied radar-equipped plane and thus gave the U-boat time to submerge.

The Allies responded with a new weapon, the ASV (a set for detecting surface vessels) on a new wave-length band. This was a joint American-British development using the microwave principle, and by the spring of 1943 the Battle of the Atlantic was being won and the great British bridgehead to the Continent was being saved.

The Germans put two expeditions of civilian experts to sea in U-boats to find a way to combat the new ASV. The first of these submarines survived thirteen days. A second, nine.

Then the Germans decided to build a submarine that need not come to the surface. They were using an air tube called the "schnorkel" when the war came to an end.

Role in the Pacific

Radar has carried the Navy to its great victories in the Pacific. In radar development the Japanese were always well behind the United States. In the old days, to fight a major fleet action at night would have been unthinkable, but with radar the Fleet could and did approach unknown harbors. Radar made it safe to cruise or fight at night under a total blackout.

The CIC (Combat Information Center) officer, with his radar, his companion device to identify aircraft and his ordinary operational information, is able to spot enemy units through pitch darkness, fog and rain. Assuming that five target "pips" show on his "scope," he is able to report to the captain an estimate, say, that two are cruisers and three are destroyers; that they are moving on such and such a course at such and such a speed and, finally, that they will come abreast his own force at such and such an hour and minute.

Automatic computers spell out range and speed of the targets. Guns are automatically conditioned and repositioned and then, when the enemy is in the most favorable position for attack, a master key is closed and the guns fire through the night at ships totally hidden from all save radar. The radar operator can actually watch the shells cross his screen toward the target "pips."

When a "pip" disappears from the screen an enemy vessel has been sunk.

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