

HEADQUARTERS
EUROPEAN COMMAND
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MS # D-042

MANUSCRIPT DATA SHEET

- I. Author: Walther von Axthelm General of Anti-Aircraft Artillery
- II. Title of Report: The Role of Searchlights in World War II
- III. Assigned: 2 May 1947
- IV. Sources:
- A. Personal: None
 - B. Reference Sources (American, German Documents; Diaries; Other Material; etc.): None. Written from memory.

EUCOM: HD: CHGB : Form 6A-2

Group Special Topics

General von Axthelm :

"Searchlights in World War II "

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Outfit at the begin of the war, improvings.

Employment of search lights white the first 3 years of war.

Indirect illumination of the air space above the clouds.

Search light used as optic signal of communication.

Small search light used against ground targets.

Search light training.

Women as search light team.

Tasks of search light in modern warfare.

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General der Flakartillerie

Garmisch, 30 April 1947.

Subject: The Role of Searchlights in World War II

Prior to World War II, searchlight units were equipped with 1.5-m. searchlights and conical sound locators. The 1.5-m. searchlight had a maximum range of approximately 10 km. The acoustic range of the sound locator was about 9 to 10 km. However, bearings could not be measured accurately above a slant range of 6 km. The acoustically gauged azimuth and elevation of the planes was transmitted to the searchlight over a so-called acoustic corrector by means of an electrical transmitting and receiving system (illuminated dials).

According to then prevailing opinion and the state of development of combat aviation, that technical equipment was just adequate to pick up targets shortly before they entered the effective zone of antiaircraft fire, and to follow and hold them with the beams of three to five searchlights so that the Flak batteries could fire on them effectively. However, by the time of the first British raids on the Reich capital early in October 1939 it already became clear that improvements were necessary, especially in the range of sound location and direction finding equipment.

To be sure the well-trained searchlight crews were able to locate the enemy raiders, which in those days came in one at a time. However, in most instances they located them not until they had entered into the range of the Flak batteries, so that valuable time was lost for firing and chances for scoring hits were diminished.

As an initial remedy for that shortcoming, sound locators were placed several kilometers in front of the belt of searchlights as an advance warning

system. Together with the increased combat experience of the searchlight crews in 1940, this procedure resulted in the early detection of targets and a considerable increase in pick-up and carry time (up to 6 minutes).

[2] The searchlights were able to execute their mission, because the raids of 1940 and 1941 generally took place during cloudless nights that afforded good visibility, and the enemy planes came over one at a time or in small, loose formations, at altitudes below 6,000 m.

During the early days of the war, the then Chief of Flak Artillery, General der Flakartillerie Ruedel, had with foresight demanded that the acoustic locators and direction finders be replaced by electronic instruments. He had also requested the development of a searchlight with greater candle power and longer range.

Those demands were met by the introduction of the 2-m. searchlight and the "Wuerzburg" radar instrument. The instruments began to arrive in 1942. It was thus possible to equip each searchlight platoon with a radar instrument, and a 2-m. searchlight as a so-called pick-up.

While the old 1.5-m. searchlight produced only 1.2 billion Hefner candle,* the light intensity in the case of the new 2-m. light had been increased to 2.7 billion Hefner candles. Although the range was not doubled, the resulting slant range of about 15 to 18 km. could be considered satisfactory. Similarly gratifying was the performance of the radar instruments, which delivered usable data up to distances as great as 20 to 25 km.

Beginning in 1942, the enemy more and more turned to raids during cloudy weather, and in 1943 began to fly real bad-weather raids. The attacks were made from higher and higher altitudes, and finally night raids were carried out from above the clouds, without visibility of the ground. This change of tactics was caused in part by the recent successes in the employment of searchlights, and the relatively large number of planes.

*Ed: Hefner candle -- official unit of light intensity in Germany. Its candle power is equal to 0.9 candle.

brought down, as a result, by the Flak batteries.

Such tactics would have limited the usefulness of searchlights to the few partial attacks that were made below the clouds or above a broken cloud ceiling, and would have eliminated the searchlight entirely in the future course of aerial warfare.

[3] Therefore, in 1943 we began to use searchlights for indirect illumination of the sky above the clouds. Searchlight beams were pointed toward the clouds in the direction of the bomber formation, after the latter had been located by radar. Proper concentration of the bundles of searchlight beams resulted in a dull illuminating effect above the clouds similar in appearance to that of frosted glass. Our own high-flying fighter formations saw the bombers silhouetted from above against the clouds that were being illuminated from below. Thus they were able to shoot down a large number of enemy aircraft.

Of course, that procedure was successful only when the ceiling was not so heavy that it absorbed the light. Generally speaking, clouds of 3- to 4-km. thickness could still be penetrated, and produce a satisfactory frosted-glass effect. In that connection it must be noted that the density of clouds varies, and ranges from a loose, light haze to densely concentrated, heavy mountains of clouds. In the latter case the antiaircraft artillery had to shoot flares under the upper edge of the clouds in addition to the action of the searchlights, and the pathfinders of our fighter formations had to drop flares into the clouds in order to achieve the necessary frosted-glass effect. Furthermore, searchlight platoons were supplied with so-called light-boxes, simple box-like instruments with numerous powerful electric

light bulbs that produced a strong light. Finally, the searchlight forces lit bundles of magnesium ^{flares} for the same purpose.

In addition to those combat activities, the searchlights were used for the transmission of communications to the flying formations. For example, numerous searchlight beams pointing in the direction of the main attack during the raid marked the general direction for arriving fighter formations. After the attack, night fighters were directed to their assigned landing fields by "direction searchlights." The vertical position of all searchlights in the combat area signalled the end of the attack and the "all clear" to fighters as well as Flak artillery.

[4] Aside from the heavy searchlights so far described, the Flak artillery had light 60-cm. searchlights at its disposal. In close co-operation with light and medium weapons, they had the task of picking up hedgehopping aircraft and aircraft at low and medium altitudes (up to 3,500 m.), and to make their destruction possible. The light searchlights were not equipped with locator instruments, but were hand-operated and adjusted according to visual and acoustic observation of the crew. With well-trained personnel they were of considerable value. On the battle fronts, especially in the East, the light searchlights were even used to illuminate battle fields. Whenever their employment in that manner took the enemy by surprise, they had a paralyzing effect on enemy forces attacking under cover of darkness.

To be sure, the position of the searchlights had to be changed after their commitment, because personnel and equipment would otherwise fall victim to enemy artillery and mortar fire which usually set in within a short time.

In 1944, when the manpower shortage in Germany became unbearable, an order issued during the fall of that year called -- unfortunately too late -- for the replacement of men in the searchlight forces by women.

Tests with female crews conducted up to that time had proved that after intelligent and systematic instruction a woman is well able to operate a searchlight successfully.

With few exceptions, the hasty change of personnel in the fall of 1944 was a failure.

In addition to some technical aptitude, the training in the operation of searchlights requires good nerves and quick reactions. Operating personnel must instantly and persistently keep up with all maneuvers of enemy planes trying to escape the light beam. The task of holding the plane in the beam is especially difficult, because due to the blinding effect of the scattered light the controls cannot be operated directly at the searchlight. They have to be located 20 to 50 m. away, oblique to the beam, at a so-called searchlight control station. That requires thorough training and a fine feeling for three-dimensional conditions.

[5] A training period of three months, and subsequently about six weeks of practical field exercises must be considered a minimum.

The importance of searchlight forces was in many instances not realized during World War II. Yet it is clear to anyone with common sense that without searchlights, a defense against enemy night raids would have been impossible, or at least limited to blind Flak barrages, as long as radar was still in its childhood stages.

Even modern aerial warfare cannot dispense with searchlights altogether. In many cases the modern high-frequency radar instruments fail to function, or are affected by active or passive interference. Then only the primitive optical light beam remains to illuminate the target directly or indirectly for the Flak batteries or fighter aircraft. Neither may the role of the searchlight as transmitter of communications from the ground to the formations in the air be disregarded completely. In case of failure of modern communication facilities, the searchlight always remains a useful expedient that can go into action at a moment's notice.

[signed:] Walther von Axthelm

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