Wartime Photographic Activities and Records Resulting Therefrom

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Library of Congress, Washington, D.C.

WORLD WAR II was as much a war of photographs as of bullets. When the first war clouds appeared above the horizon, the United States was as well equipped as any nation to utilize the potentialities of photography to the utmost. At the outbreak of World War I quite a different situation prevailed, for the United States at that time depended heavily on Europe for photographic equipment, particularly lenses, and for dyestuffs used in the manufacture of sensitive materials. Indeed, when we entered World War I there were only a few pounds of optical glass on hand and no facilities existed anywhere in this country for making more. Stocks of German dyes, even with the supplemental cargo of the German merchant submarine *Deutschland,* were exhausted long before war was declared.

As a direct consequence of World War I, the United States was forced to expend huge sums of money for research and development work in many technical fields. The American photographic industry was particularly successful in achieving its goals. The German monopoly of dyestuffs was broken; the manufacture of optical glass was achieved; new methods, products and processes rapidly appeared. Photographic manufacturing joined the ranks of the more important American industries.

As the conflict in Europe progressed from a "phony" to a shooting war, our national defense program shifted into high gear. The unparalleled resources of the nation were marshaled for war production. Existing plants were operated on an around-the-clock basis. New manufacturers entered the field. Practically all of the greatly expanded output of photographic equipment and supplies was purchased by the government or channeled to friendly nations. Manufacturers continued to make cameras of standard design, some with small alterations, but many new ones, intended for particular and often highly specialized purposes, were developed. During the war the average citizen found that photographic cameras and supplies became increasingly hard to procure. Favorite brands of film and paper were seldom obtainable. All

equipment was scarce, expensive and, for the most part, could not be secured without government priority.

American industry used photography for an almost inconceivable variety of purposes. Photographic identification cards were issued to employees. Individual x-ray photographs or radiographs were made of entire factory staffs and the x-ray became a vital link in assuring the dependability of equipment through its use in detecting flaws in castings and metal parts. The aircraft industry devised a method of projecting precision drawings on metal plates and of making duplicate true-to-scale templets on metal by photographic processes. Instrument dials were manufactured photographically. All varieties of photographic recording were employed, for example, periodic photography of instruments indicating the performance of mechanical equipment.

Ultra high speed photography was further perfected and, along with stroboscopic photography and time lapse motion pictures, was put to use in research, development, and production. The technique of assembly was speeded by exploded drawings recorded and even animated photographically. Personnel received instruction in many new skills, in safety and hygiene, with the aid of training films. The science of ballistics was advanced by triangulation cameras. Instruction manuals, of which there were literally thousands, were prepared by offset printing which required photographic techniques. Advance copies were often prepared entirely by photography.

Within the armed forces photography was everywhere. On entering the service the recruit was photographed for his identification card and an x-ray photograph was made of his chest. He saw training films on first aid, survival in emergency, instruction in doing the particular tasks assigned to him, as well as many other subjects. Well over ten thousand training films were produced. In practice, gunners fired camera guns that photographed gun sights and targets so precisely that, had the guns been real, hits and damage could accurately be assessed. In combat, automatic cameras in wings, bomb bays, or elsewhere, provided an accurate and useful record of a mission. Sequences of action made by these recording instruments were features of wartime news reels and of the productions "Fighting Lady," "The Battle of Midway," and others.

One of the more important wartime photographic assignments was the transmission of the serviceman's mail, V-mail, that maintained close contact with home, half way around the world. Through an adaptation of microphotographic techniques, 16mm. and 35mm. film were used to transmit these communications. The note to be sent V-mail was photographed on one hundred feet rolls of 16 mm. film, approximately five thousand messages to each roll. The films was processed and sent to its destination by highest priority air express. At the

destination a machine automatically enlarged the messages on rolls of paper measuring four and one-fourth inches wide by eight hundred and twenty-five feet in length. The individual messages, each four and one-fourth by five and one-half inches in size, were then cut from the rolls and distributed in the same manner as ordinary mail. Two essentially similar services, V-mail and official mail, were operated simultaneously; V-mail received wide publicity, official mail did not.

From the beginning, when the V-mail service was organized, until November 1, 1945, when it was terminated, 648,108,066 communications were transmitted overseas, while 614,822,846 were received by the army alone. In the same period the Navy and Marine Corps handled about two million communications. Much of the film and sensitive paper that was so scarce at home during the war years was used for these purposes. The satisfactory morale building job done by V-mail is well known.

Microfilm, however, played a spectacular part in many other operations. The overhaul and repair of aircraft and ships at the many far-flung bases of this truly global war was a critical necessity—blueprints of parts and assemblies were essential to accomplish these repairs expeditiously. Not considering the time of preparation, to distribute the fifteen thousand drawings of a Corsair F4U fighter on paper to all operating bases was an impossibility from the standpoint of paper production and ship transport. Yet the drawings *on microfilm* of all types of operational aircraft, and equipment to read and reproduce them, were distributed to four hundred and fifty naval air activities by the Bureau of Aeronautics, and to an unknown number of ship's bases by the Bureau of Ships. The Bureau of Aeronautics alone shipped the equivalent of more than fifty million drawings on microfilm. Similarly the army distributed drawings in great numbers to their operations. At the conclusion of the war approximately nine-tenths of Naval Air activities were dependent on microfilm for technical information.

As a corollary the use of microfilm was directly responsible for reductions of at least seven hundred and fifty thousand dollars in aircraft contracts. This saving was made possible because aircraft factories were not required to supply large numbers of blueprint copies.

Technical letter material on 35 mm. microfilm was mailed every day, within twenty-four hours from the time it was signed, to six hundred installations. The printer's copy of all technical notes and technical changes affecting aircraft as well as flight medicine notes was microfilmed and sent from the Bureau. The microfilm was usually not enlarged but was read on a reading machine. The information contained on the microfilm in most cases reached its destination within a few days, whereas the printed material did not arrive for from one to three months. In the supremely important field of technical changes affecting

aircraft, microfilm kept outlying bases fully up to date long before it was possible to receive the printed document.

A project was instituted whereby a microfilmed map of an island in Japanese hands was superimposed upon a radar photo of the surrounding submarine topography. Skilled technicians were able to gauge depths, spot hidden reefs, and thus facilitate landings on islands where no actual soundings could be made. Microfilm was used because the variable projection feature allowed parity adjustment with the reduction scale of the radar or photo.

The tremendous savings in space effected through the microfilming of records, at a time when floor space was as scarce as meat is today, is a matter for passing mention, not because it was unimportant—the exact opposite is true—but because it is completely familiar. Thousands of precious cubic feet of storage space were released, security copies of precious records were made, and the complicated administrative routines of the armed forces were speeded up through the uses of photography.

The broad picture of World War II is here, on film—for the record. An undeniable, incontrovertible, record of how the United States awakened, arose, armed, trained, and fought.

While new applications have the freshness of novelty, established methods and old photographs were often of great value. When the Japs invaded Attu and Kiska, the best photographs then available were some ninety odd from the National Archives made in 1883 by a geologist, aboard a fishing steamer, studying pelagic sealing in the Berring Sea. These photographs saved valuable time and probably many lives in that foggy, inhospitable area. Public and private photograph collections were searched for details of all enemy-held territory, particularly for views of cities, towns, ports, and installations of all types. Hundreds of thousands were accumulated, tabulated, and used for surveys and studies of all types dealing with the effective prosecution of the war.

In operational work photography was of paramount importance. Aerial photography developed with unparalleled speed. When the war was concluded, more than three-fifths of the fifty odd million miles of land area of the earth's surface had been mapped, some of it many times. Aerial reconnaissance photography was invaluable. In estimating ground conditions, the photo interpreter made valuable use of his knowledge of the ecological site characteristically occupied by each species of vegetation identified on aerial photos. There are numerous familiar examples of site preferences of vegetation. Willows prefer stream banks; sage brush and cactus indicate very dry sites; the bald cypress thrives only in swamp land. In the tropical Pacific areas where, during World War II, aerial photo interpreters were called upon to estimate ground conditions affecting military operations, many species

of vegetation show similarly specific site requirements. Mangrove trees indicate muddy salt swamp; casuarina trees prefer firm sandy beaches; and sago palms occupy fresh water swamps. In some cases a simple and plausible explanation for this site specificity of plants is found. Thus, willow trees are said to require large amounts of soil moisture because, in the atmospheric conditions favoring excessive loss of water vapor from leaves, the stomates or pores in willow leaves, unlike those in most leaves, do not automatically constrict; unrestricted transpiration is the result. Photo interpretation saved lives, material, and time.

For aerial photography varieties of film were used, each for a particular purpose. Panchromatic film with a yellow filter was the standard for reconnaissance and mapping. Color film and camouflage film were also used to a great extent. Special aerial cameras were designed as the war progressed to serve particular purposes. One worthy of mention is the Sonne continuous strip camera developed by the Chicago Aerial Survey Company.

The film capacity of this new camera was large enough to photograph a strip of terrain more than twenty miles long at a scale of one inch = fifty feet. The complete automatic installation weighed a little under one hundred pounds. Special lens viewers were provided for uninterrupted viewing of the strip photos. A floating mark comparator has been developed by the same company for photogrammetric measurements on the strip film. The wartime uses of strip photography required minimum altitude flying at extremely high plane speeds, that in combat, strangely enough, proved to be relatively safe. With the cameras mounted in fast fighter planes, flying at altitudes of one hundred to five hundred feet, the only anti-aircraft fire encountered came from hurriedly manned small arms and light machine guns. Usually the plane had flashed over the target and disappeared before enemy gunners could be alerted. The photos obtained were remarkably sharp and of extremely large scale. Naturally, at such low altitudes the coverage was very narrow in width. This limited the use of the camera to the coverage of spot targets or carefully selected strips of terrain. The most important use of strip photography by the Navy was in the stereoscopic measurement of water depths on the assault beaches of enemy-held coral islands in the western Pacific. The Sonne camera was also used by the Navy to great advantage in ground support photography in cooperation with the Tenth Army and the Third Marine Amphibious Corps through the Okinawa campaign. This latter application was very effective in the location of Jap cave defenses and the detection of camouflage. In Europe the Army is reported to have had fine results in low level strip reconnaissance, both in vertical and oblique photography. Although synchronization cannot be perfectly maintained for more than one distance from the camera to the object, there is enough leeway in synchronization that

sufficiently sharp stereo photos can be obtained from an obliquely mounted Sonne camera. Strange background distortions are apparent, but the oblique photos have proved very useful for special reconnaissance purposes.

Mapping was also done with the aid of trimetragon photography. In trimetragon photography an assembly of three cameras was used, one camera was directed vertically downward and two were mounted at an angle of thirty degrees from the horizontal and perpendicular to the line of flight. The two oblique cameras were so placed that they photographed both the horizon and a small area covered by the vertical camera. All cameras are exposed simultaneously so that the area from horizon to horizon, perpendicular to the line of flight, was covered by three photographs.

Practically all aerial photographs are exposed with a high overlap so that each successive picture contains sixty percent of the area covered by the preceding picture. It was therefore possible to prepare stereo pairs for use in detailed study. It is interesting to note that the entire French D-day Coast was mapped and vectographs (three dimensional photographs) were prepared and studied in detail by the Allied commands preparatory to the landing.

In the advanced areas where the fighting was thickest, film and camera carried on—in the rear where tactics were planned and logistics devised, the light-tight box and sensitized material worked overtime. On the home front, the photograph fought to speed the mass of detail a war generates.

The technician can view with profound satisfaction the progress made in photography in World War II, and, if time permitted, the few illustrations of photographic activities could be multiplied a hundredfold. Archivists, however, will probably view the results of these photographic activities with emotions ranging from appreciation and delight to dismay and panic. There are scattered in many depositories throughout the United States and the world literally thousands of tons of photographs of all types, enough, if gathered together in one place, to fill the National Archives building to overflowing. After all, the output of the photographic materials industry was absorbed for war purposes for a period of several years, and in dollar value the expenditures probably ran into the billions. Not all of the photographs purchased by these billions are records; in fact the greater quantity are not, although at this juncture little can be said with certainty about the extent of the photographic records problem. Whether one hundred million, two hundred million, or more, feet of motion picture film of record character was produced during the war cannot yet be determined. It is known that training film, feature pictures, short subjects, combat footage,

seized enemy films, gun and recording film, and other similar materials exist on 16mm. and 35mm. film in enormous quantities. There may be one or several hundred duplicates of a particular title; sometimes the same picture may carry sound tracks in thirty or more languages. Aerial photographs including mapping, reconnaissance, three-dimensional and trimetragon survey film, bomb damage photographs, target surveys, mosaic maps, and vectographs are estimated to number in the millions. All of these are certainly not records. If during a flight of three hundred B-29 bombers over Japan, each plane photographed the operation, at least ninety percent of the photographs would be considered substantial duplicates and subject to weeding. Areas were mapped and re-mapped many times. Technically poor and overlap material will be subject to elimination.

Still photographs, including negatives and prints, were also produced by the millions. A single file, for example, containing several hundred thousand photographs, might be duplicated in at least a dozen localities. As the still files are located and studied, the record picture will begin to take shape, and some progress is being made in this respect.

Microfilm, although photographic in format, is essentially documentary in character. The problems incident to wartime accumulations of microfilm are, therefore, no different from those encountered with paper records except, of course, that due allowance must be made for the inherent characteristics of microfilm; that is to say, special consultation, filing, and storage methods differing from paper records, must be applied. Insofar as the V-mail operation is concerned, no problem exists, for by regulation the microfilms were destroyed immediately after the paper prints were mailed. Official mail, technical communications, intelligence data and material plans, all on microfilm, remain to be considered. A postwar microfilm activity of considerable significance is still going forward. It consists of the reproduction of seized enemy documents for use by government agencies and in some cases for distribution to research and manufacturing organizations in this country.

The problem of photographic records viewed in the aggregate is tremendous, but work on its solution is going forward on many fronts. As files are consolidated and organized, duplicates can be eliminated. Materials of purely operational or specific character will likewise be discarded. As has been indicated, the broad lines of effort are already laid down, and the over-all picture is hopeful. Special cases and records that have become estranged for one reason or another will constitute special problems. It is with a sense of great relief that the technician can place these problems in the competent hands of present and future archivists.