PHOTOGRAMMETRY IN MISSISSIPPI

Aerial photography was first used in Mississippi in 1933. I. W. Brown, at that time Field Location Engineer, made an 18-mi location in the Delta area of Mississippi using aerial photographs borrowed from the County Board of Supervisors. In 1935, the first contract for aerial photography for highway usage was let. This was an experimental venture on seven different locations to represent average conditions to be found throughout the State. These photographs were used primarily for location work. A short time later, however, some of this photography was used to make a comparative cost test of measuring drainage areas. It was determined at that time that by using aerial photographs, the cost was approximately 15 percent of that of conventional methods of measuring drainage areas by field crews working on the ground.

In 1957, Mr. Brown was asked by the Director to set up a division for photogrammetry and electronic computing. Some trained personnel from other divisions were transferred and other personnel were hired and started on an extensive training program. Equipment was purchased and for all practical purposes, production was started in June 1958.

Aerial photography is used primarily for map compilation. The other important uses include:

1. Road inventory surveys;
2. Making general highway county maps;
3. Compiling detail drainage network sectional maps;
4. Making drainage area surveys;
5. Accomplishing section and property line ties for right-of-way work;
6. Making bridge location studies;
7. Completing river control and erosion studies;
8. Making municipal surveys;
9. Compiling property estimates and land usage maps;
10. Preparing photographic mosaics for special studies and highway route location work;
11. Compiling planimetric and topographic maps for special studies and highway design;
12. Making photographic enlargements for detail studies;
13. Photogrammetrically measuring cross-sections for computing earthwork quantities; and
14. Making reconnaissance surveys for accomplishing geodetic control surveys and recovery of station markers of control.

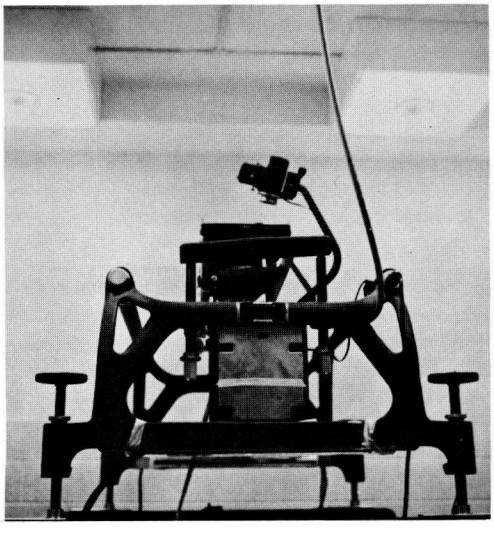

Figure 1.

The photogrammetric instrument section has three Kelsh stereoscopic plotters, as well as two Balplex tables with Multiplex aeroprojectors used exclusively for training purposes. Kelsh stereoscopic plotters are operated on two shifts and sometimes three, depending on the amount and emergency of the work load. One of the plotter rooms has been equipped with a variable intensity lighting system (Fig. 1). Four 300-w silver bowl, louvered fixtures are mounted in the ceiling above the stereoscopic plotter. These lights are controlled by variable potentiometers. The "incident light" measurement may be varied from 0.66 foot-candles (the output of the Kelsh instrument projectors) to a maximum of 48.0 foot-candles; the aver-

age building corridor is usually lighted to a 6 to 8 foot-candle intensity. Of the two photogrammetric instrument operators who have used this room, one started plotting at 2.75 foot-candles and is up to 3.25 foot-candles at the present time. The other operator started at 2.43 foot-candles and is now plotting with 4.67 foot-candles of light. Shift supervisors have a tendency to do their check work at a much lower intensity than the instrument operators. Using a comfortable amount of light may greatly reduce eye strain. In addition, it is a great timesaver, especially in measuring cross-sections, the dimensions of which are recorded manually.

The photographic laboratory has a Saltzman enlarger, Kargl copy camera, and a LogEtronic printer as the main components. All photographic processing, with the exception of aerial film negatives and two sets of contact prints, which are furnished by contract, is done in the laboratory. This work includes making extra copies of aerial photographs for field work, photographic mosaics, diapositive plates, map manuscripts, property boundary descriptions for right-of-way work, and various photographic enlargements for all phases of our highway work. A photographic mosaic is also printed on plan and profile sheets (Fig. 2).

Aerial photographs are used in all phases of field surveying of basic and supplemental control. All reconnaissance surveying and highway design are done by use of the aerial photographs and/or photographic mosaics. One interesting use of aerial photographs is the recovery program in which all existing control, both vertical and horizontal, in a township are identified and circled on a photographic mosaic (Fig. 3). These mosaics and identifying descriptions of the control points are bound by counties and sent to the project engineers. This procedure promotes the use of good control all over the State by the various construction districts. Control survey crews completed a 42-mi section of the Natchez Trace for right-of-way work (see Report of Region 15, U. S. Bureau of Public Roads, elsewhere in this publication). On conclusion of this work, a detailed report on procedures, cost, and other items, was prepared.

As all basic field control surveying is done, permanent station markers are set. Bench marks are set about 1 mi apart and the horizontal control station marker consists of surface station and underground mark, two reference marks, and an azimuth

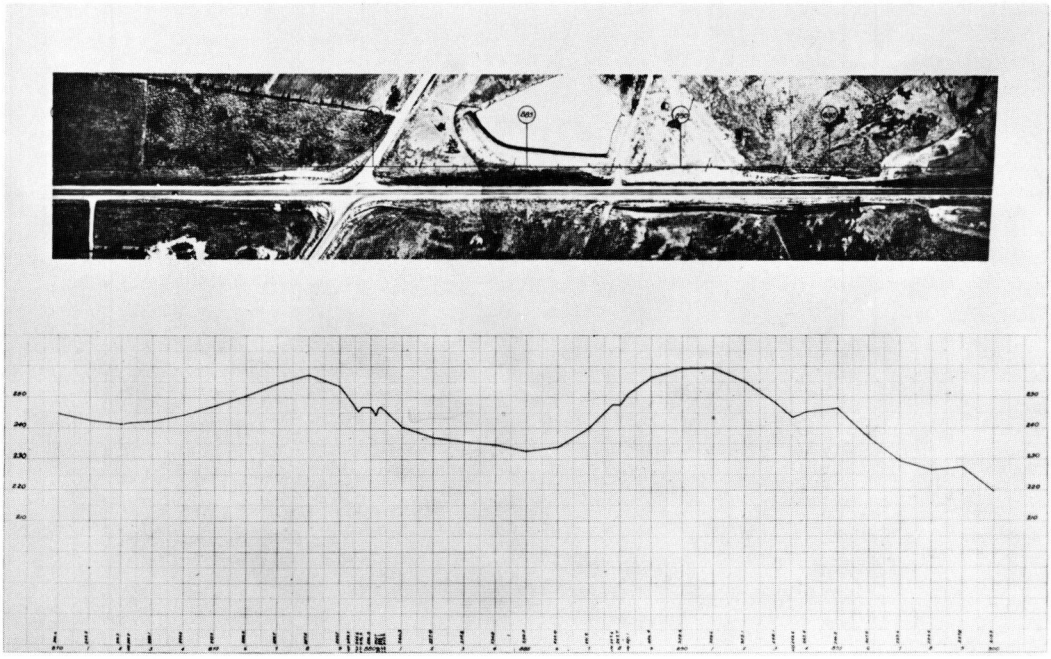

Figure 2.

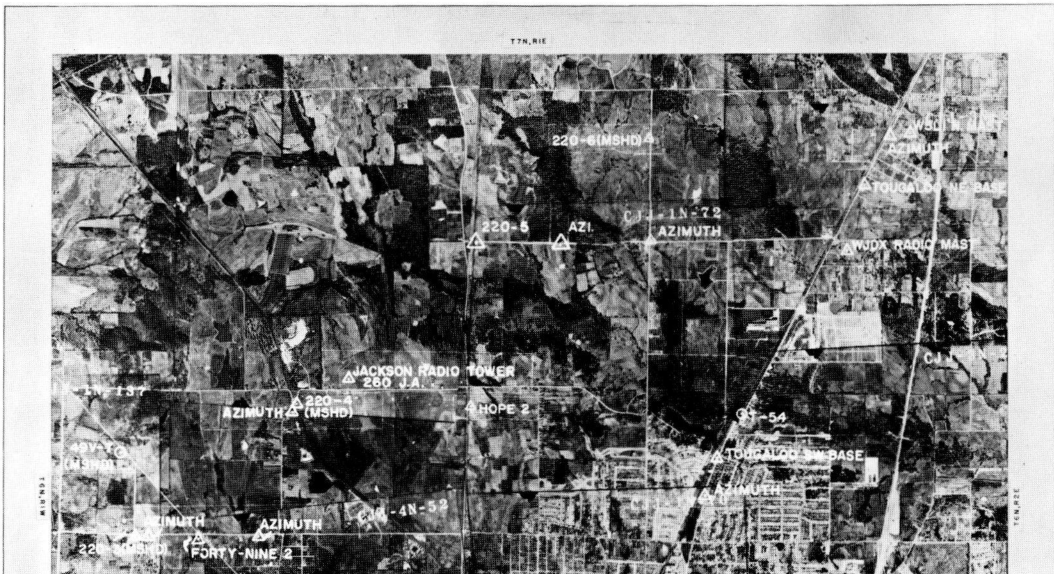
T7N,R1E
220-6(MSHD)
AZIMUTH
TOUGALOO NE BASE
CJJ-1N-72
220-5
AZI.
AZIMUTH
WJDX RADIO MAST
JACKSON RADIO TOWER
260 J.A.
220-4
AZIMUTH
(MSHD)
HOPE 2
T-54
TOUGALOO SW BASE
AZIMUTH
CJJ-4N-52
AZIMUTH
AZIMUTH
FORTY-NINE 2
49V-6(MSHD)
CJJ-1N-185
49V-5(MSHD)
AIR BASE CONTROL TOWER
V-167
AZIMUTH
T-167
X-167
HAWKINS
Y-167
220-2(MSHD)
AIRPORT BEACON
49V-4(MSHD)
49V-3(MSHD)
MILLSAPS
AZIMUTH
JACKSON
W5
U5
T6N,R1W
T6N,R2E
T5N,R1E
Prepared by
Photronics Development Division
Mississippi State Highway Department
Scale in Feet
0 1320 2640 3960
HINDS COUNTY
T6N,R1E

Figure 3.

mark. The field crews surveying vertical control use Zeiss self-leveling levels and K&E yard rods with foot-strips on the side for accuracy check.

The horizontal control surveying crews use Bilby aluminum towers, Tellurometer, and T-2 theodolites. The geodetic marker surveying program was planned for setting station markers along approximately 1,276 mi of the primary highway system.

Most aerial photogrammetric projects are targeted, using opaque white plastic material, except on sand bars where black is used. The material comes in 36-in. widths at $0.23/yd and is not retrieved because of the low cost. Specifications for setting targets, as well as for the complete photogrammetric work of each highway location and design project, from planning to the contract construction stage, are described in "Photogrammetry and Data Processing in Mississippi" by I. W. Brown, as prepared for the Committee on Electronics at the 47th Annual Meeting of AASHO, Denver, Colo., Oct. 1961.

A topographic map for highway location and/or design, at an appropriate scale, should be considered just as necessary for making an optimum location as any of the other tools now being used. The key to this concept is the word optimum. There is no doubt good highway locations can be, and are being made, without using large-scale topographic maps. Such a map, however, is a tool which, in the hands of an experienced engineer, provides an opportunity to determine and compare, in detail an almost limitless number of feasible locations at practically no additional cost, resulting in a highway that will be cheaper to build, cheaper to maintain, and provides the best possible traffic services.

PHOTOGRAMMETRIC ACTIVITIES OF THE PENNSYLVANIA DEPARTMENT OF HIGHWAYS

Charles E. McNoldy, Chief Photogrammetrist
Pennsylvania Department of Highways

Aerial survey methods, including photographic interpretation and photogrammetry, are utilized by the Pennsylvania Department of Highways in all appropriate phases of highway location and design. Utilization of these methods, however, is progressing cautiously due to some inaccuracies and unsatisfactory results encountered by the Department on early mapping projects. Adequate specifications and supervision of projects by professional photogrammetric engineering personnel have materially aided in attaining better accuracy in mapping for highway engineering purposes during the past several years and in developing more advanced techniques.

The initial significant expression of interest in photogrammetric methods, as an internal function of the Department of Highways, was purchase of a Kelsh stereoscopic plotter in 1955. Due to lack of trained photogrammetric personnel, little developed from this first step until January 1958 when the present organization came into being. The Photogrammetric Unit is currently organized in the Bureau of Design and reports to the Assistant Chief Engineer in charge of that Bureau.

Photography

The Department contracts with commercial photogrammetric firms on a negotiated basis for aerial photography. An aerial camera has recently been acquired to obtain oblique photography for planning purposes and for evaluating construction progress. The Department contracts for the use of an airplane and pilot, but the aerial photographer is a member of the Department's photographic staff.

Aerial photography to be used for mapping by photogrammetric methods is taken at scales of 1,000, 500, and 250 ft to 1 in. Specifications require the use of a distortion-free 6-in. focal length precision aerial camera. A contract with the U. S. Department