at any point of ±3 mm. (full scale) for a 40 foot dish if the above two changes were adopted.

The old and standard method of directly measuring a stereoscopic model referenced to visually oriented axes proved to be more reliable than measuring the model referenced to axes determined from the shape of the model. Since only a small part of the paraboloid is represented in a radio antenna and since this part of the surface differs very little from other second degree surfaces including the sphere, the shape method of defining reference axes is not practical. However, the method may be of value in determining the orientation of a vector with respect to other surfaces.

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*Determining Small Deflections in Aerodynamic Models**

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ABSTRACT: *Through the use of photogrammetry this paper presents an approach to the problem of the determination of small deflections in aerodynamic models. The results of experiments in both the static and dynamic conditions are presented.*

THIS paper presents the results of experiments to determine the feasibility of utilizing photogrammetry for determining small deflections of an aerodynamic model in both static and dynamic conditions. Since the consistent determination of these deflections is at present exceedingly difficult, or impossible, it is hoped that photogrammetry may provide the solution, provided sufficient accuracy can be obtained. These then are the results of the first such steps in that direction.

Photographs for the project were taken with a pair of Santoni photo-theodolites, equipped with a pair of auxiliary lenses of 100 cm. focal-length. The cameras utilized glass plate negatives 10×15 cm. in size. The theodolites were mounted on a bar to obtain a minimum of motion.

The model to be photographed was about 14″ wide by 10″ high. It was constructed of balsa wood, with an aluminum spar through its center, so that in all respects it would react as a full-sized section would respond when loads of different amounts and with various conditions were applied.

For horizontal and vertical control an aluminum sheet, with a one-inch grid scribed upon it, was mounted upon a sheet of three-quarter inch plywood. The outline of the model was traced upon the surface of the plywood, and this portion was cut out so that the surface of the model was flush to the surface of the plywood.

To check the calibration of the plotting instrument, three machined aluminum plugs were mounted upon the surface of the aluminum sheet. The heights of these plugs were .250″, .500″ and .880″.

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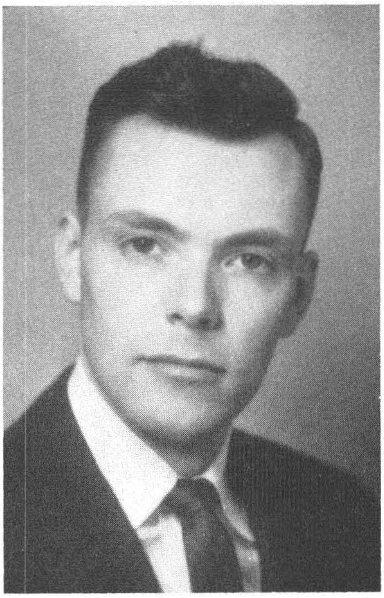

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The photographs were taken at F/22 at 1/100 second. Illumination for the photographs was provided by two 150 watt flood lights. The plates had a XX emulsion on them.

STATIC TESTS

A total of ten sets of photographs were taken in the static condition. The first was of the model without any applied load. Each of the other nine sets had a different load applied at a different position. Utilizing three control points upon the background, each model was then contoured. An interval of .012″ was used with .006″ supplementals in the flatter areas. Table 1 contains a summary of the maximum deflections of the tip of the model, due to the various loads applied upon it.

TABLE 1

Test No.	*Load Position*	*Tip Reading*	*Deflection*
1	Tare	.390	.000″
4	1	.520	.130″
2	2	.468	.078″
3	3	.466	.076″
5	4	.467	.077″
6	5	.448	.058″
7	6	.436	.046″
8	7	.438	.048″
9	8	.426	.036″
10	9	.424	.034″

Positions 1, 2, 3, had a three-pound load applied to them while each of the other positions had a four-pound load applied. All of the loads were applied normal to the model surface. The illustration shows the location of the positions as well as the amount of deflection due to the load at that point.

As a check upon the accuracy of the set-up, one model was leveled, using the known deflections at three of the nine load positions as level points. Readings were then taken at the other six positions. These results are shown in Table 2.

TABLE 2

Position	*Known Surface Reading*	*Stereo-Reading*	*Difference*
1	.393	.393	.000″
2	.3925	.3925	.000″
3	.344	.342	.002″
4	.336	.336	.000″
5	.368	.363	.005″
6	.322	.322	.000″
7	.326	.326	.000″
8	omit	—	—
9	.361	.361	.000″

Points two, seven and nine were used to level the model. Thus it can be seen that three of the remaining six points read "zero" while two had slight deviations from the true readings. Point eight was not used because imperfections on the model surface prevented obtaining exact readings.

When the differences between the contours of the tare model and the loaded models were compared, it became apparent that vibrations from an outside source had caused a shifting in the background between the time the

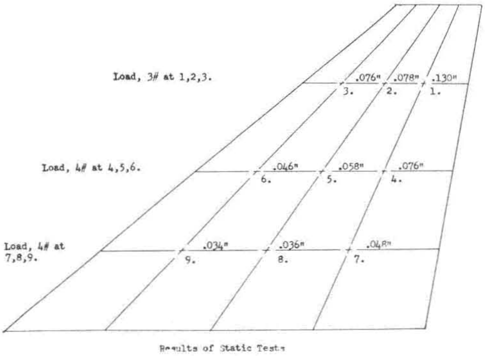

FIG. 1. Maximum deflection of tip of model due to loads applied at different positions.

photographs of the tare model were taken and the completion of the photographs of the loaded models. It thus became necessary to correct for this deviation by means of a mathematical correction. Unfortunately, this did not correct the situation entirely and so the value of the results was somewhat nullified.

Dynamic Tests

Only two pairs of photographs were taken of the model in a dynamic state. These were at 196 and 213 vibrations per second. A strobe light with a speed of 1/5,000 of a second synchronized with the maximum point of vibration of the model was used to obtain the photographs. The lighting for these models was not as good as with the static models, and it was not possible to use the same control points. The models were contoured however, and a distinct difference was observed in the surface of the models. It was noted that one model was in a state of tension while the other was in compression.

Conclusions

It is unfortunate that more time could not have been spent in experimenting with this project; however, the allotted time was very short and there was not sufficient justifications to proceed farther.

I believe the results, while possibly not being everything desired, do show that a definite solution to a very difficult problem is possible through the use of photogrammetry.

It is hoped that in the future it will be possible to expand upon the basic steps taken here. Lighting and control are two major problems, as well as the need for better cameras. All of these problems can be overcome, however, and when they are, a new and exciting field will be opened to the photogrammetrist.

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*Continuous Strip Photography—An Approach to Traffic Studies**

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(*Abstract is on next page*)

Introduction

The objective of the traffic engineer is to provide for the safe, rapid and efficient flow or movement of traffic, that is, people and goods. In carrying out this over-all objective, he must not only plan and design new traffic carrying facilities, but must insure efficient operation on existing ones. The planning, designing and operating phases all involve the extensive use of traffic data obtained from the present transportation system. Consequently, it is necessary that the present-day traffic data which are collected be accurate and as current as possible. At the same time it is necessary to keep data collection costs at a minimum.

Volume and speed data are of major concern to the traffic engineer. The current methods of collecting these data involve manual or mechanical field testing or recording. Their main advantage is the simplicity of the data-collection process. On the other hand, they include one or more of the following disadvantages:

a) The collection process is time-consuming (placing the automatic counters, picking them up, removing the tape, etc.).

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