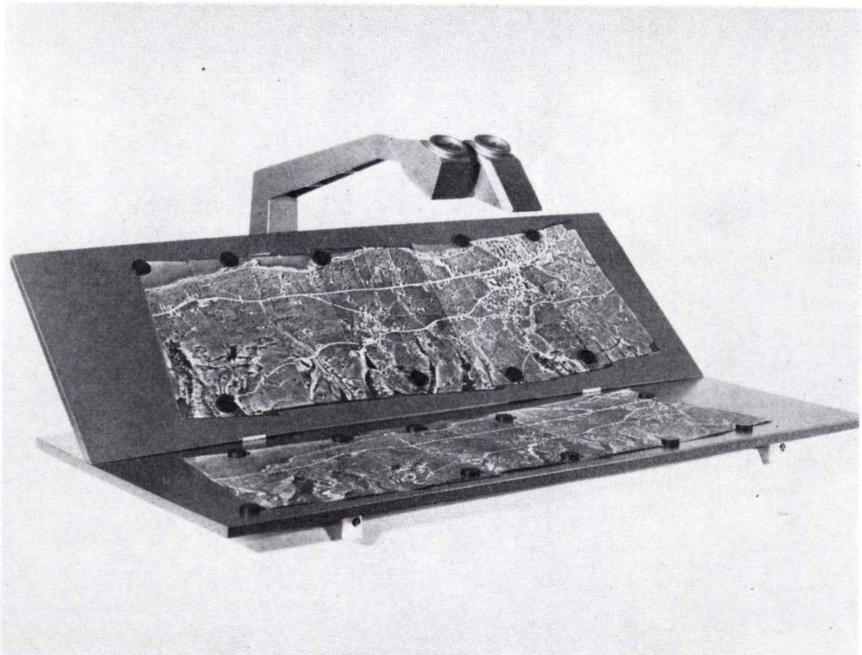

FRONTISPIECE. The Wild ST10 Strip Stereoscope

KALEVI ERANTI*
Finnmap, Kiviaidank 9
Helsinki 20, Finland

Stereoscope for Strips

Expected to be particularly useful for the planner and the interpreter.

(*Abstract on page 1045*)

INTRODUCTION

IN THE PLANNING of cities, highways, railways, electricity transmission lines and pipe lines etc. a map is needed as the planning medium. Even the best of maps, however, does not give the planner a vivid picture of the country. I might go so far as to say that the planner has a burning need for a living picture of the country. The optical stereomodel formed by a stereopair of photographs is a good solution. Planners who have not used the mirror stereoscope will, in general be enthusiastic about its possibilities. But the initial enthusiasm wears off very quickly because spatial observation is only possible for one model at a time and this creates a troublesome problem.

It has until now been impossible to obtain a general stereoscopic image of the entire terrain although a single stereomodel is still an important aid in planning. These thoughts, arising during practical activities, gave me the inspiration to pursue the idea further and then suddenly I found the solution for the continuous spatial observation of more than

* Presented at the Annual Convention of the American Society of Photogrammetry, Washington, D. C., March 1968, by Charles E. Sheaffer, Jr., of Wild Heerbrugg Instruments Inc., Farmingdale, N. Y. 11735 under the title, "An Original Stereoscope Design."

two aerial photographs. I was surprised at the extraordinary simplicity of the solution.

THE NEW METHOD AND INSTRUMENT

Figure 1 shows photographs 1 to 5 of a strip of aerial photographs. Figure 2 shows

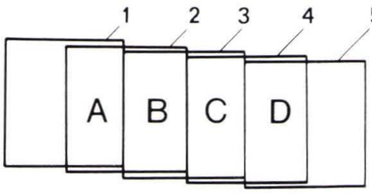

FIG. 1

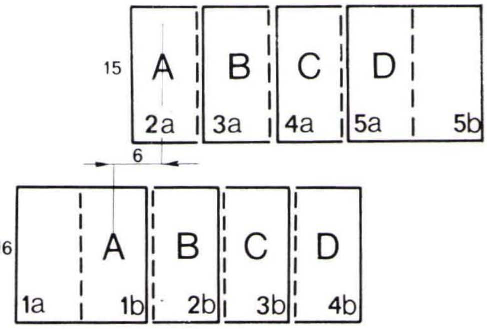

FIG. 3

ABSTRACT: *The disadvantage of the conventional mirror stereoscope—that only one stereo-pair can be observed at a time—led to the concept of a new type of stereoscope which can be used to scan a properly oriented strip of photographs.*

how the photographs are arranged for observation under a conventional mirror stereoscope; *A*, *B*, *C* and *D* show the zones—each separated—which may be viewed stereoscopically.

In Figure 2 the lines along which the pictures (according to my idea) are first to be cut are shown dotted and the corresponding halves of the picture are identified with the consecutive picture number by the letters *a* and *b*. The picture halves are now arranged according to their consecutive numbers, as shown in Figure 3 in two parallel strips. The upper strip 15 comprises the halves *a* and the last picture and the lower strip 16 comprises the first picture and the halves *b*. Thus all the parts which must be seen by the left eye for stereoscopic perception are arranged in the lower strip whereas all the parts which must be seen by the right eye are arranged in the upper strip. Figure 3 also shows how the two strips are displaced relative to each other in the direction of the flight-strip axis by the eyebase (6) in order to accommodate the stereoscope to be described later.

The entire strip can now be observed stereoscopically with a modified Helmholtz type of mirror stereoscope. The eyebase (6)

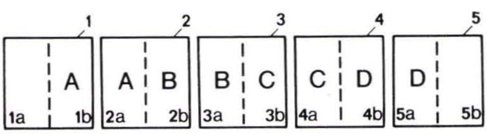

FIG. 2

is set parallel to the strip axis. Figure 4a shows a plan of the stereoscope and Figure 4b the side view. The mirrors (10 and 11) below the oculars (8 and 9) deflect the rays through 90° on to the further mirrors (12 and 13). The rays are then deflected on to the picture plane (14). The upper strip is at (15) and the lower strip at (16). The modification of the Helmholtz type of mirror stereoscope is shown in Figure 4a. The two mirrors (8) and 12) must rotate the optical axis through the left ocular by 90° in a clockwise direction so that the observer (7) sees the lower strip (16) with the left eye. The mirrors (11, 13) must rotate the optical axis through the right ocular (9) by

CHARLES E. SHEAFFER, JR., Speaker

90° in the anticlock-wise direction so that the observer (7) sees the upper strip (15) with the right eye. Therefore it is a necessary condition for the stereo effect that homologous points of the two strips (15 and 16) must be displaced relative to each other by the eye-base (6) in the direction of the flight-strip axis.

The strips (15 and 16) are mounted on a slide which can be displaced along the axis of the flight-strip so that the observer can scan from one end to the other.

If a mirror stereoscope modified in this way is used for observation of aerial photographs of 23×23-cm format (the most widely used format) to scan the whole length of the strip, then correspondingly large mirrors will be necessary. Furthermore, as a result of the large separation, there will be an optical reduction of scale and the observing position will be uncomfortable.

To overcome these disadvantages, the arrangement shown in Figure 5 was devised. Oculars (17) for the left eye and (18) for the right eye are provided. The ray path for the left eye passes through a five-sided prism (19) and is deflected through a total angle of 22.5° downwards to the lower strip (16). The ray path for the right eye passes through a similar prism (20) and is deflected by 22.5° upwards to the upper strip (15). The working table (14) is so arranged that the strip 16 lies horizontally while the upper strip (15) is at an angle of 45° to the observer. A stereoscope designed according to this principle is now being produced, under license, by Wild Heerbrugg. It has been given the name *Wild ST10 Strip Stereoscope*.

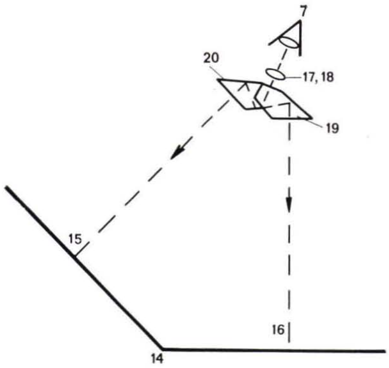

FIG. 5

STEREOMAPS—A NEW AID FOR THE PLANNER

Consider, as an example, aerial photographs taken as for normal mapping with the strips lying in the east-west direction. If the aerial photographs are cut in halves and oriented strip by strip in the device, the observer has in front of him a three-dimensional map of a strip of terrain which may be as long as is required and practical. I call this a *stereomap*. If the strips are copied photographically the following advantages exist:

- The preparation of the Stereomap is quick and inexpensive, and the work is easy to learn.
- Storage is simple, being similar to that of map sheets.
- The stereomaps are ready oriented and always ready in a moment for stereoscopic observation.
- The image quality of the stereomodels is good.
- The use of the stereomaps and of the stereoscope is very simple and rapid.
- The planner can show the results of his work directly on the stereomap or, on an orthophotomap.
- In an unmapped or badly mapped terrain the stereomap gives an extraordinarily rapid map since it gives an extremely good picture of the whole terrain.
- The stereomap can also be made from enlarged parts of the photographs.

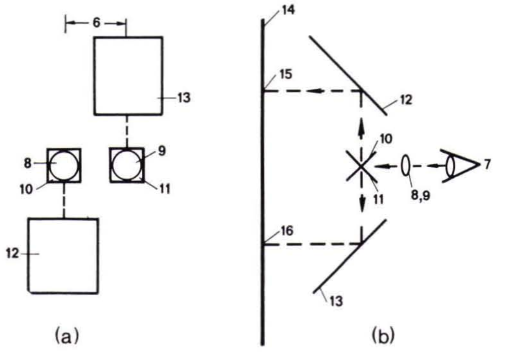

FIG. 4

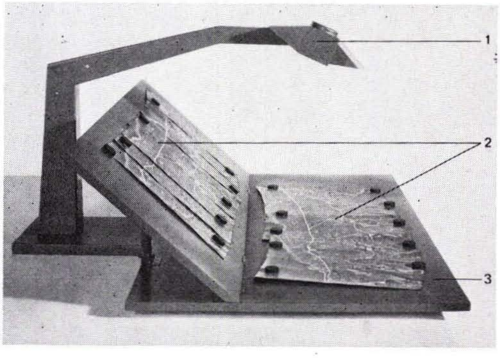

FIG. 6. 1 Stereoscope. 2 "Half"-strips. 3 Scanning Board.

. . . And for the Interpreter

The advantages outlined above are valid also for the interpreter and lead me to predict that stereomaps, bringing a miniature model of the terrain onto the table of the planner or interpreter, will be widely used in the future, either as a by-product of normal mapping, or as specially produced for the purpose. The importance of stereomaps from any arbitrary type of aerial photography is perhaps even more important for interpretation than for planning, because the continuous spatial observation of a wide terrain offers new possibilities in interpretation.

Further Possibilities

From time to time it is necessary for two people to observe simultaneously the same object stereoscopically. For this case it is possible to construct a stereoscope for two observers. It is also possible to arrange the strip 15 and 16 so that they each contain photographs from a number of overlapping flight strips giving continuous spatial observation over a large area or block.

New Books

Thesaurus of Engineering and Scientific Terms, Engineers Joint Council, 345 E. 47th St., New York, N. Y. 10017. 696 pages, hard covers $25.00, flexible covers $19.50.

The Thesaurus is designed to lay the ground work for compatible information systems in all technical disciplines. It provides the base for effective retrieval by any engineer or scientist familiar in general with the subject area in which he is searching.

The book contains over 18,000 separate descriptors for use in indexing and retrieval and in addition some 5,000 entries referring to one or more of the descriptors as preferred indexing terms. All areas of science and technology are covered includ, ing the engineering disciplines—mechanical, civil, electrical, chemical, etc.—the sciences of physics-chemistry, mathematics, life sciences including medicine and biology, social sciences, economics, and military science.

The book was developed over a period of $2\frac{1}{2}$ years. Some 300 engineers and scientists from government, industry and education took part in the project.

Control for Mapping by Geodetic and Photogrammetric Methods, Edited by P. V. Angus-Leppan, Dept. of Surveying, Univ. of New South Wales, P. O. Box 1, Kensington, N.S.W. 2033 Australia, 330 pages, $8\frac{1}{2} \times 10\frac{1}{2}$, $3.25 postpaid.

This report on the colloquium held at the University May 22–24, 1967 consists of a compendium of 17 papers together with discussions of some of them. Some of the papers were modified because they were originally presented with numerous slides, and others were abbreviated by omitting appendices. The discussions were summarized and edited. The authors are Australian with the single exception of Dr. G. Konecny of the University of New Brunswick, Canada.

Site Selection Techniques, Dr. R. B. Forrest, Bendix Research Laboratories, Southfield, Michigan, May 1968, Air Force Technical Report No. AFWL-TR-67-146.

Aerial photographs constitute the principle data-collection source for the selection of sites for the construction of new facilities. Several different kinds of camera geometry include various focal lengths and both vertical and convergent stereo photography.