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A 35MM AERIAL PHOTOGRAPHY SYSTEM FOR FOREST AND RANGE RESOURCE ANALYSIS[1/]

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Small format aerial photography has long intrigued on-the-ground resource managers as a possible tool for gathering useful, low-cost information on short notice. In many field situations, the necessary components of such a system are already largely present: a 35mm camera, adequate photographic skills and a relatively inexpensive light aircraft. But since both the information needs and component characteristics often vary, it is sometimes difficult to determine how best to combine them. Possible solutions to this problem do exist, however - as is evidenced by the variety of successful 35mm aerial photography systems now in existence (e.g., 1, 2, 3, 4, 5 and 6).

A word of caution at this point: small format aerial photography is not a substitute for conventional forms of 9x9-inch format metric camera resource coverage on large areas! Zsilinszky (5) has, accordingly, very aptly termed 35mm aerial photography "supplementary aerial photography".

The system presented here is less sophisticated than Zsilinszky's (5) - the latter being, in our opinion, one of the (if not the) best developed, thoroughly field-tested and widely used systems in existence. Although of lower capability, the system to be described is a possible substitute where the available aircraft is not equipped with a camera port, cannot be structurally altered and/or the aircraft are of a variety of types obtainable on an as-is pickup basis.

The unit was originally designed for range vegetation studies in Montana, requiring large scale photography (about 1:3200) taken from rather low altitudes (1000-1600'). This necessitated rapid cycling, so a motordrive camera, the Minolta SR-M (Figure 1), was selected due to its comparatively low cost, compact configuration and adaptability for conventional ground applications with or without the motordrive. For smaller scales of photography, cycling rate requirements are slower and hand-operated cameras can be used with certain adaptations of the mount which are now under test. For the time being, however, the system functions most conveniently with the motordrive unit.

[1/] A cooperative project initiated in 1970 between the Montana State Office, USDI, Bur. of Land Mgmt., and the Univ. of Minn. Coll. of Forestry.

[2/] Prof., Univ. of Minn. Coll. of Forestry, St. Paul. It would be most presumptuous for this writer to assume the role of either sole or senior author of this article in view of the massive input of encouragement, technical advice, materials and facilities by the following coworkers in Montana: (1) Res. Div. Chief J. Linne, Nat. Res. Spec. H. Cosgriffe, Malta Dist. Mgr. D. Solari, Area Managers L. Brown and J. Hicks, and V. Stickley of the RM Staff - all from the Bureau of Land Management; (2) Prof. R. Eng, Dept. of Ent. & Zool., MSU; and (3) Wildlife Biologist F. Gjersing, Mont. Game and Fish.

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Figure 1. Motordrive camera and components

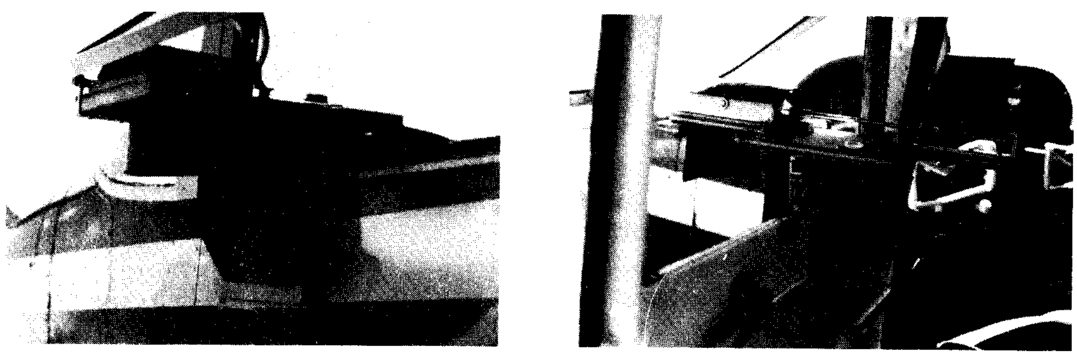

Figure 2. Camera mount in position on aircraft door. Note sighting plane along side of aircraft (left photo). Camera slides along rod into aircraft for film changes (right photo).

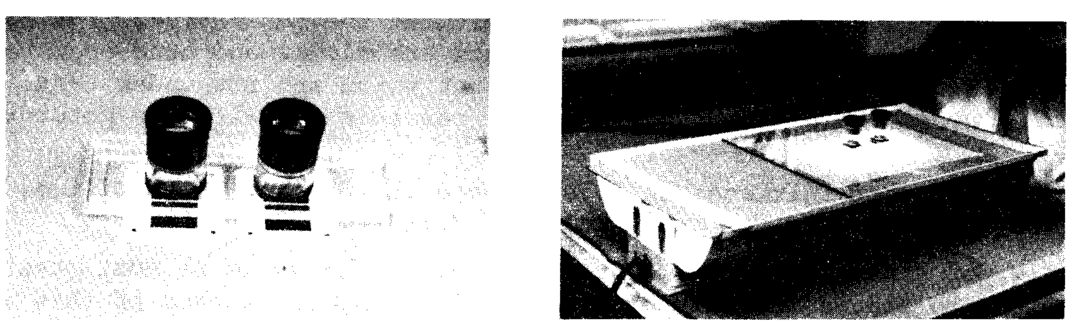

Figure 3. Stereoscopic viewer and light table.

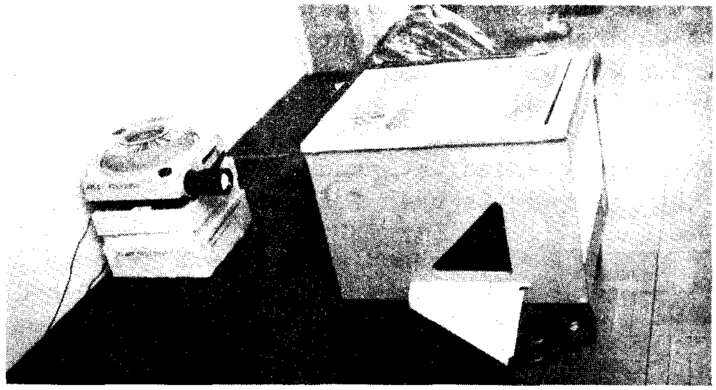

Figure 4. Mapping unit utilizing first surface mirror.

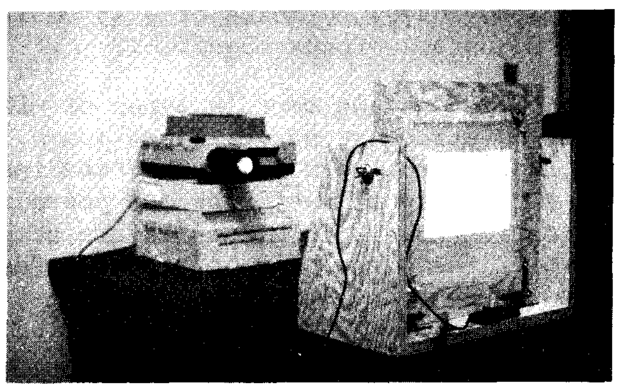

Figure 5. Mapping unit without first-surface mirror.

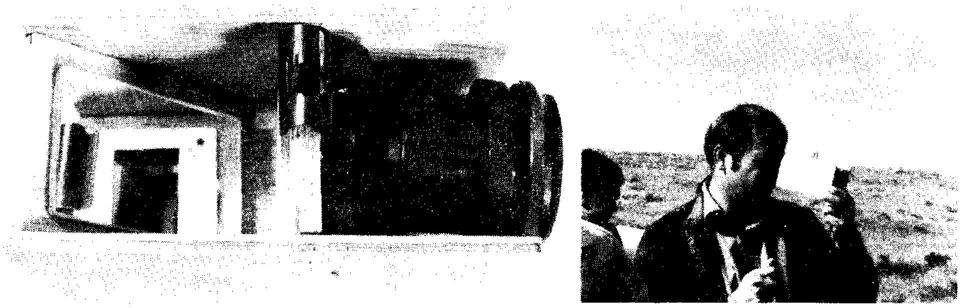

Figure 6. Field viewer.

The mount (Figure 2), constructed with simple tools from available off-the-shelf materials, is designed for the left door since most windows open only on that side. The camera can be levelled on entering the target area by adjusting its clamp position on the door, along with a thumbscrew arrangement on the hinged camera mount board. In flight, the slipstream holds the window open, and the camera and mount can be installed, and removed, while airborne - a desirable feature in chilly weather! The camera slides inside for film change and an operational table has been developed for selecting the proper scale/focal length/shutter speed/airspeed/coverage combination. The sighting plane along the side of the aircraft is used for navigation.

Stereoscopic viewing can be accomplished by a viewer (Figure 3) made of plexiglass and two 6X magnifiers and a light table consisting of a 2-bulb 20-watt fluorescent ceiling fixture, plywood mask and a piece of glass backed with frosted drafting film.

Two possible types of rear projection screens can be used for mapping. One (Figure 4) utilizes a first-surface mirror to reflect the projected image onto the screen in a horizontal position. This is somewhat more comfortable to map from than the vertical screen type (Figure 5), although the latter is simpler to construct and detail is somewhat sharper. In both cases, the position of the screen can be "plumbed" with the projector by means of a projected grid transparency. This removes projection tilt and insures accuracy of distance and area measurements.

When field checking is desirable, the viewer shown in Figure 6 utilizes skylight for illumination (adequate on cloudy days) by means of a 45° mirror. Magnification is provided by a 6X wide-angle adjustable focus magnifier.

Successful applications to date include certain types of wildlife habitat analysis, water quality surveys, engineering structure surveillance (dams, spillways, spreader dikes), range resource survey, range trend studies and forest insect detection. Field personnel have experienced no difficulty in mastering the photography and mapping system in a short time. Application trials in Minnesota are scheduled to begin in the spring of 1973 in cooperation with the Minn. Dept. of Natural Resources, The Northwest Paper Co., the Superior National Forest and others.

Acknowledgements

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