Aerial Photography Brief

Cessna Aircraft Cabin Door Mount for Photographic and Videographic Cameras

Daniel S. Long
Department of Plant and Soil Science, Montana State University, Bozeman, MT 59717
John E. Taylor
Department of Animal and Range Sciences, Montana State University, Bozeman, MT 59717
Jack McCarthy
School of Forestry, Northern Arizona University, Flagstaff, AZ 86011

INTRODUCTION

LAND MANAGERS AND RESEARCHERS use small-format aerial photographs as inexpensive yet effective tools for surveying and monitoring land (Frazier *et al.*, 1983; McCarthy *et al.*, 1982). Cost, quality, and portability advances in electronics have led to recent investigations of video remote sensing as another effective small-format approach for land management (Meisner and Lindstrom, 1985; Everitt and Nixon, 1985).

There are several methods for obtaining small-format photographs that use high wing aircraft, a suitable camera mount, and a small-format camera (Parker and Johnson, 1970; Meyer and Grumstrup, 1978; Mason and Mathews, 1981; Woodcock, 1976). The most important difference among the methods involves the camera mounting technique.

We have tested small-format aerial photograph and video image collection using a camera mount designed for the Cessna 150 and 172 models. Implanted in the right cabin door, the mount design allows (1) mounting both videographic and photographic cameras, (2) access to the imaging system without opening windows, (3) wide-angle views of the ground with little to no airframe obstruction, (4) one-man flying and remote sensing operation if necessary, and (5) airframe modification without placing permanent camera ports in the aircraft hull. Construction of the mount requires a salvaged right cabin door of an appropriate Cessna model and some common aircraft construction materials.

CONSTRUCTION

The mount is a streamlined rectangular enclosure fastened over an opening cut into the right cabin door (Figure 1). Instead of using the original door, we recommend that another door be acquired for this purpose from an aircraft salvage yard. The mount consists of three sections which include a leading edge fillet, a camera compartment, and a trailing edge fillet.

FIG. 1. Camera mount installed on a Cessna 172. Leading edge fillet (rounded, forward-most section) and trailing edge fillet (wedged, rear-most section) streamline the box shaped camera compartment (middle section).

Construction begins by cutting a rectangular access hole in the door and riveting an aluminum reinforcement around the cut out area. Aluminum angle is then riveted to the areas above and below the access hole in order to form a structure for fastening the camera compartment. The camera compartment is essentially a box framed by angled

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aluminum and covered by aluminum sheet. The compartment is positioned over the access hole and riveted to the aluminum angle structure. Circular holes for camera ports are cut in the bottom of the compartment.

Trailing edge fillet construction is similar to the compartment construction except that it is shaped like a wedge instead of a box. Aluminum angle and sheet are again the main construction materials. The fillet is fastened as a unit to the door and previously attached camera compartment. The leading edge fillet is simply a shaped balsa or polystyrene block that can be glued or screwed to the front of the camera compartment.

Cameras are secured by bolts that are tightened into each camera base. Photographic cameras mount within the camera compartment. A video camera mounts inside of the trailing edge fillet to the backside of the camera compartment (Figure 2). The Cessna 172 mount features a swinging bracket for attaching dual cameras (Figure 3). The bracket is made of two aluminum plates that are welded together at right angles. An aluminum rod is welded to the lower edge of the bracket and serves as an axle for turning the bracket assembly. Cost of the mount totals approximately $535 itemized as follows: salvaged door, $125; aluminum, $50; fasteners, $10; and labor, $350. Additional information, parts lists, and mechanical drawings are available from Robert Mitchell of Eagle Flight Aviation, Inc., Belgrade, Montana upon request.

MOUNT APPLICATION

The Cessna 172 mount accomodates dual EL-M 500 Hasselblad cameras and a single video camera. The smaller size of the Cessna 150 limits the mount to single Hasselblad and video cameras. A 35-mm Canon F1 camera equipped with and without a large film back has also been used in both mounts. Minor changes in the mount dimensions will accomodate other cameras that are differently sized than the above.

The right front seat of the Cessna 172 prevents access to the camera mount and needs to be removed. Access to the camera mount is easily made from the pilot and rear passenger stations (Figure 4). Removing the right front seat will allow use of

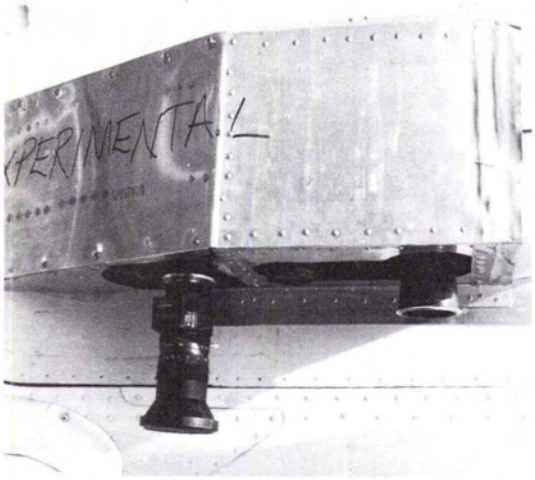

FIG. 2. Video camera (far left lens) shown housed within the trailing edge fillet and mounted to the rear bulkhead of the camera compartment. Dual Hasselblad (right lenses) are shown mounted within the camera compartment.

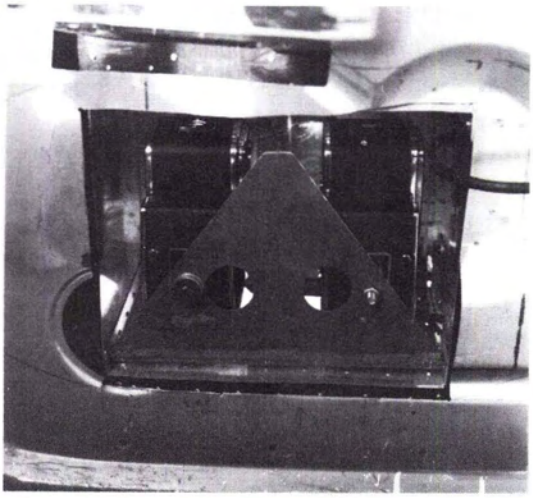

FIG. 3. View, from inside the aircraft, of dual Hasselblad cameras mounted within the camera compartment to swinging bracket. Cameras can be swung into the cabin area from the vertical position (illustrated).

FIG. 4. Cabin view from the rear passenger station towards the right front area with seat removed. Video monitor and recorder are shown resting on the cabin floor together with the Hasselblad cameras retracted from the camera compartment.

the floor area as a platform for video equipment. The right front seat can remain in the Cessna 150 when only using one photo camera; however, additional use of a video camera requires that it be removed so more room is available for a video monitor and recorder. In this case, flying and remote sensing activities are limited to a one-man operation. We find this can be done safely if flight planning and camera adjustments are made before a flight, equipment operation is simplified or semi-automated, and an experienced pilot-photographer is performing the mission.

The swinging bracket of the Cessna 172 design allows easy access to the cameras for inflight film loading and lens adjustment. Camera removal and installation with the Cessna 150 mount is made easy by using a quick release bracket that allows the camera to be clamped instead of bolted. Leveling is achieved by turning the cameras to the desired position and then tightening them down.

We target photographic cameras by using a video monitor as a view finder. Subject areas are recorded on film when they appear fully on the monitor. Targeting is also facilitated by skilled flying and by knowing the ground covered by various lenses at different altitudes.

Installation and removal of the mount is done by means of the two hinge pins that attach the door to the airframe. A quick release pin can be installed to simplify interchanging doors and to provide an emergency release because the mount limits the door opening to about 2 feet of travel.

No adverse effects to aircraft performance and stability are caused by the mount. The Federal Aviation Administration has, to date, required that individual aircraft be designated in a restricted category whenever the mount is in place. Aircraft revert to the utility category when the original door is installed. Doors from Cessna 172 models L through N are interchangeable with the Cessna 182 model Q.

CONCLUSIONS

This camera mount design offers an inexpensive and efficient approach to small-format photographic and videographic image collection. Internal access to externally mounted cameras overcomes difficulties imposed by small aircraft cabin space such that flying and imaging operations are more convenient. The idea is easily adapted to several Cessna high wing aircraft and variety of small-format cameras.

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