

Data Collection Using Exotech Model 100 on a Bell Helicopter

Log for June 19, 1978

We (Dick Mroczynski and Larry Biehl) arrived at the lab at 5:00 A.M. to load up equipment into a Purdue car. The equipment taken is listed in Appendix A. Also noted in the appendix are those items which were actually used. Equipment preparation before this day included 24 man hours (plus Weldon Vons time to make a mount) over a one week period. During that time the rented data logger (Fluke) was checked out, cables were made, and a mount was made to attach the Exotech Model 100 and a camera to the helicopter.

We arrived at the test site at 8:45 A.M. (a 3 hour and 15 minute drive). The helicopter was delayed because of heavy fog. The helicopter was owned by the Indiana Department of Natural Resources and was stationed in Indianapolis. While waiting for the helicopter, the 20' x 40' gray canvas (60%) panel was staked to the ground; stakes were put in every third ring around the edge.

The helicopter arrived around 10:15, just as the cumulus clouds began to develop. The mount was attached to the helicopter (a good fit). Also, the polarity of the helicopter's power supply was checked and the last two wires soldered to the connector accordingly. The equipment was plugged together; everything worked properly. Do to limited space in the helicopter, the inverter was put on the floor on the passengers side and the data logger was stood on end on the seat between the pilot and passenger (data collector being Dick).

The field of view of the Exotech was checked; the edge of the field of view was five inches away from strut (see Figures).

Three runs of data were collected with a dark level and cal at the beginning and end of each run. The first two runs were very cloudy - 50-60% clouds; the cal appeared good however. The Exotech Model 100 battery was

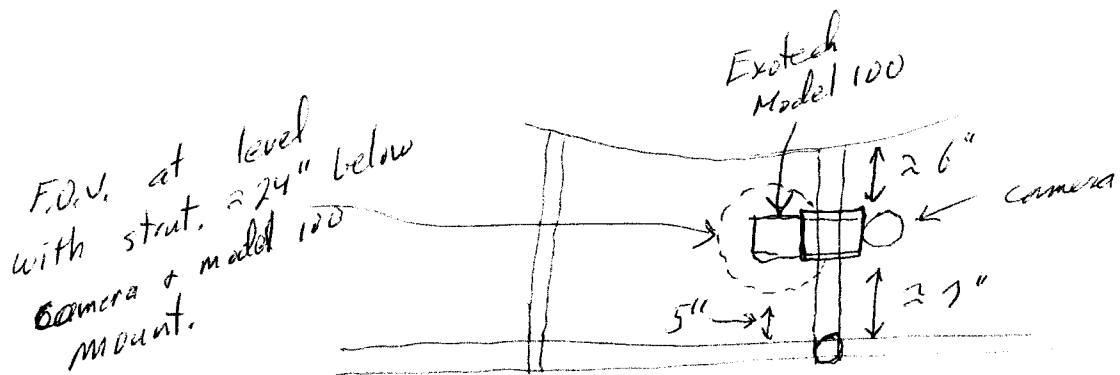
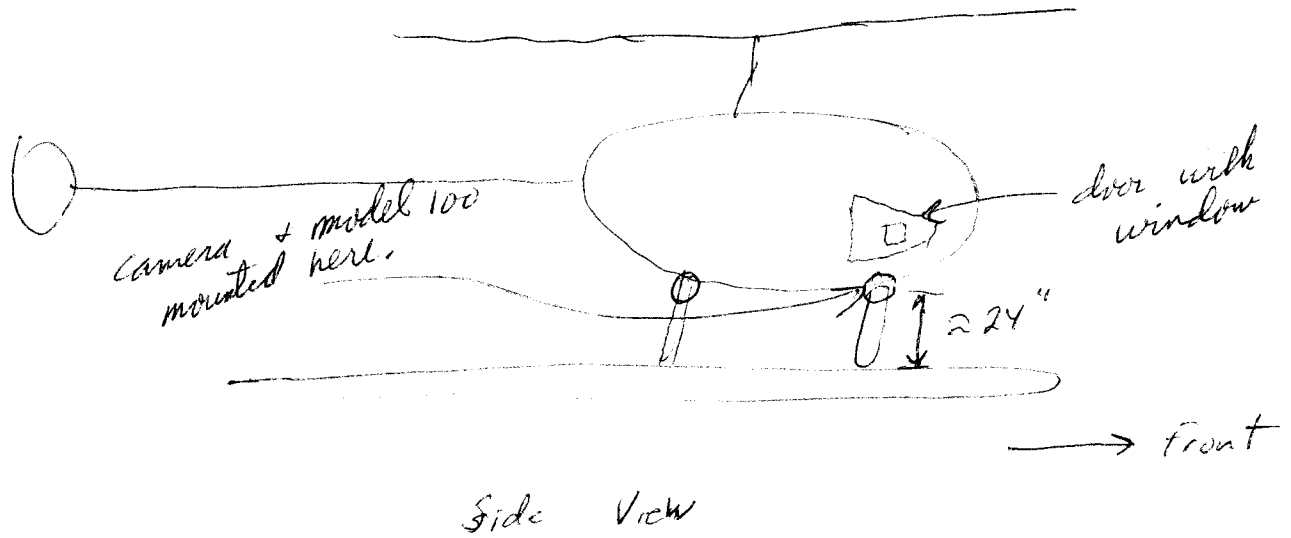
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changed between runs 2 and 3. The last run should be the best - only 30% clouds.

Significant problems for the day were (1) Not knowing where the data was being collected on map and (2) the 4 bands of data not being collected simultaneously. The first problem can probably be overcome by using the 35 mm photography. There is no fix for the second problem except for having a data logger with simultaneous sample and hold. It is estimated that 2 seconds were required for the data logger to collect the four bands of data. Moreover it probably took 3 seconds from the time the collection was initiated until the last band was recorded. The first second included two prints for time and fixed data code.

The third and last run was completed at 1:12 P.M. The Exotech Model 100 was disconnected from the helicopter and attached to a boom and tripod mount. Data were then collected over the gray panel to reference it to a painted BaSO_4 standard (2x2 PNL-4).

The equipment was loaded back into the car; we ate and then drove back to West Lafayette. We arrived at LARS at 6:30 P.M. One note - the car was essentially full: 2 people and equipment.



Top View

Figure 1. Location of mounting of Exotek Model 100 and camera in helicopter.

Appendix A

Equipment Taken to Pigeon River State Fish and Wildlife Area

- * - Exotech Model 100
- * - Exotech Model 100 Manual
- * - Spare battery for Exotech Model 100
- * - Model 100 and camera mounting bracket
- * - Inverter
- * - Cables from power source to Inverter
- * - Cables from Inverter to Data Logger
- * - Cables from Exotech Model 100 to Data Logger
- * - Camera and film
- * - Trigger cable for camera
- * - Data Logger
 - Paper tape for Data Logger
- * - Watch
- * - Notebooks and pencils
- * - Gray Panel
- * - Stakes for Gray Panel and rope
- * - Heavy hammer or ax
- * - Tool box (Biehl's)
- * - Volt-Ohm Meter
- * - Solder and soldering iron
- * - Calculator (calculator gone - slide rule)
- * - 2x2 BaSO₄ panel
- * - Tripod, boom and standard holder
 - Fuses (1 Amp/125 volts)
- * - Small screwdriver, needle nose pliers, wire strippers
- * - Dark Cover

Appendix A

45

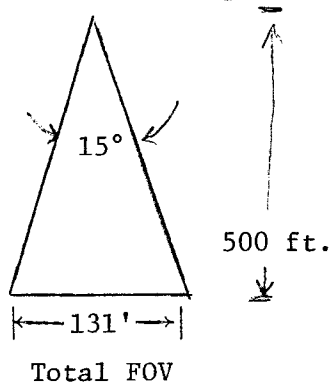
Equipment Taken to Pigeon River State Fish and Wildlife Area (cont.)

- * - Black Tape
- * - Angle finder - bubble level
- Jumper leads
- Flash light

* Items actually used

Appendix B

1. Flightlines flown at 500 feet above ground level



2. Area of Field of View 13,613 sq. ft. or .3 acres
3. Assume flightlines flown at 40 mph (59 ft/sec)
 - a. In 2 seconds to collect 4 bands, FOV would have moved 118 feet.
 - b. In 3 seconds from time sequence initiated, FOV would have moved 177 feet.

Run #1

11:08 Dark level

11:10 Cal. No clouds over sun but sky is grim. 50% - 60% clouds.

~~Cal was~~

- All connections appeared good
- Model 100 at .8 on battery.
- Cal was good, set right on panel, ^{~20'} Once over panel, it didn't bellow up. Got 5 ~~shots~~ ^{observations} hopefully (stopped at airport and got gas during run)

11:55 - Cal Clouds were near sun.

Run #2

12:10 - Dark level

12:12 - Cal ? Didn't appear to be well over panel before moved on.

12:30 - Cal. Miss north of center - piddly okay

Run #3

12:56 - Cal Good shot, No clouds near sun. Should have gotten 5 good observations. Next time should come from North or just west 30% clouds

1:04 Cal came from east No good shadows

1:10 Cal came from west Good cal

1:12 Dark level

Dark Leads

1. = -65

2. = +28

3. = -13

4. = -27

8

Std. (Painted Barium Sulfate)

1 = 25072

2 = 32045

3 = 22796

4 = 30220

Panel obs #1

1 = 17170

2 = 21840

3 = ~~21879~~ 15909

4 = 21219

Panel obs #2

17162

21867

15868

21270

5/18/77
W. J. ...
D. J. ...
Transfer

Observation #1

$$\text{Band 1} \quad \frac{17170 - (-65)}{25072 - (-65)} \times 79.5 = 54.5$$

$$\text{Band 2} \quad \frac{21840 + (+28)}{32045 - (+28)} \times 80.5 = 54.8$$

$$\text{Band 3} \quad \frac{15909 - (-13)}{22796 - (-13)} \times 80.6 = 56.3$$

$$\text{Band 4} \quad \frac{21219 - (-27)}{30220 - (-27)} \times 84.8 = 59.6$$

Observation #2

$$\text{Band 1} \quad \frac{17162 + 65}{25072 + 65} \times 79.5 = 54.5$$

$$\text{Band 2} \quad \frac{21867 + 28}{32045 - 28} \times 80.5 = 54.9$$

$$\text{Band 3} \quad \frac{15868 + 13}{22796 + 13} \times 80.6 = 56.1$$

$$\text{Band 4} \quad \frac{21270 + 27}{30220 + 27} \times 84.8 = 59.7$$

Rumbe/LITRES

Gray Panel 1 Reflectance for Bands 1-4, 54.5, 54.8, 56.2, 59.6