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3.3(h)(2)

6.2(d)

ORD-0327-76

5 February 1976

MEMORANDUM FOR THE RECORD

SUBJECT: TCT Activities Regarding Bird Camera

1. This memo covers the period between 5 January 1976 and 4 February 1976 regarding the progress for developing and testing a bird camera. The memo dated 5 January 1976 contains the original program schedule. At this time, the program is on schedule.

2. On 12 January 1976 the first model of the new 16 mm camera was received from [redacted] and tested. The frame rate of this camera is about one frame per second with a field of view corresponding to a footprint on the ground of 50 feet along the flight path and 90 feet transverse to the flight path at an altitude of 100 feet. Since the velocity of the bird is about 50 feet/second, (perhaps a little faster), this geometry yields approximately 140 contiguous pictures. From an altitude of 100 feet, this gives a strip 90 feet wide and 7,000 feet long for a total area coverage of about 630,000 square feet or 14.5 acres.

3. On 21 January 1976 [redacted] went to [redacted] with camera #1 to conduct further tests with [redacted] and to pick up camera #2. Tests conducted at this time showed a resolution of about 0.75 to 1.0 inch at 100 feet when the camera is fixed and not moving.

4. On 23 January, these two cameras were test flown on live birds at [redacted] facility in California. The purpose of this test was to obtain in-flight pictures and to ascertain firsthand the problems of working in the field. Three full rolls were taken in flight. One roll of the 3400 film (ASA -64) was used with camera #2 and a neutral density filter #1. Two flights were also made using the high-resolution 3414 film (ASA -5) since the illumination was very good (the light meter reading showed 16,000 foot candles). Prior to each flight, pictures were taken of a resolution chart at 50 feet, and an additional ten resolution charts were placed horizontally in the compound (about 100 feet on a side) to determine resolution from the air.

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5. Some of the positive results of this test are as follows:

a. Of the 140 pictures on a roll, approximately 70 will be of good quality. This means about the same resolution transverse to the direction of motion (1 inch per 100 feet) and a degradation of two to four in the direction of motion.

b. About 14 pictures (10 percent) included some part of the compound (about 100 feet on a side) and about ten pictures include at least one resolution chart. Of these ten pictures, about half showed the "good quality" described in item (a).

c. The bird orbits were about 200-300 feet in diameter with several straight-line crossings directly over the compound at 75-100 feet altitude.

6. Some of the results of this test which indicate corrective measures are:

a. The 3414 film is highly sensitive to the humidity buildup in the dark bag used for the camera loading. This causes a degradation in film resolution, a defocusing of the camera due to warpage of the film, and a sticky texture of the film which unduly loads down the camera motor.

b. An additional silver cell battery (4 grams) was required to provide reliable camera operation in the field.

c. The timing circuit failed due to lack of proper potting and did not fit well in the forward fairing.

d. There was a lack of selection of neutral density filters for use with the 3400 film. The filter used caused the film to be underexposed.

e. The recommended developer (MX-819) for the 3414 film did not appear to work as well as the more conventional D-19 developer. Development should be undertaken only by experts familiar with this highly specialized film.

7. At this time, the following actions are under way:

a. The timing circuit has been reconfigured to fit around the camera next to the body of the bird and includes

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two silver cell batteries. A pull tab around one battery will start the timer when yanked out. A dummy configuration including camera and timer will be sent to [redacted] next week for checking compatibility with the bird.

b. Camera #1 has been modified to provide a continuous film speed of 0.44 inch per second. This will compensate exactly for linear image motion blurring when the bird is at 100 feet altitude flying at 54 mph, or at 75 feet altitude flying at 37 mph. It is felt that on an average this will reduce motion blurring by at least a factor of two. This camera is in the mail and will be tested next week against moving targets (resolution chart on a car).

c. An appointment has been made to see [redacted] (Extension 3514) of NPIC on 9 February 1976 to discuss the possibility of using NPIC to process all 3414 film and provide guidance on dealing with humidity problems.

d. A series of neutral density filters is being collected for use with the 3400 film.

e. The new camera has also been modified so that the film can be attached to the take-up reel prior to going to the field. This will reduce handling and load time in the field by a factor of three or four.

f. The design of the larger (lower F number) lens is completed and will be delivered in early March. This will allow for a faster shutter speed with the 3414 film which will further reduce motion blurring. Also, the new camera (with present lens) will be fitted with a faster shutter speed for use with 3400 film.

g. Plans are now underway to test the latest modifications under simulated field conditions in [redacted] where any camera problems can be dealt with directly by Mr. [redacted] Hopefully, the film taken during this simulated field test can be processed by NPIC.

8. At this time, the results of the flight tests indicate that the original estimate of 1.5-to-2-inch resolution at 100

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feet can be obtained, and the probability of getting several (five to ten) good pictures of the target per roll of film is better than originally expected.

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