Aerial Photography of Marine Mammals using a Radio-Controlled Model Aircraft

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AERIAL PHOTOGRAPHY OF MARINE MAMMALS USING A RADIO-CONTROLLED MODEL AIRCRAFT

by

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ABSTRACT

Sleno, G. A., and A. W. Mansfield. 1978. Aerial photography of marine mammals using a radio-controlled model aircraft. Fish. Mar. Serv. MS Rep. 1457: 7 p.

This report is a summary of an experimental project using a radio-controlled model aircraft to obtain aerial photographs of a herd of beluga whales in the Canadian Arctic. Results, problems and possible future use are described.

Key words: Aerial photography, marine mammals, behaviour.

RESUME

Sleno, G. A., and A. W. Mansfield. 1978. Aerial photography of marine mammals using a radio-controlled model aircraft. Fish. Mar. Serv. MS Rep. 1457: 7 p.

Ce rapport est le résumé d'un projet expérimental utilisant un avion miniature télé-commandé, équipé avec un appareil photographique pour obtenir des photos aériennes d'un troupeau de bélugas dans l'arctique Canadien. Les résultats, problèmes et usage possible dans le futur sont discutés.

INTRODUCTION

The comparatively recent development of small, efficient multi-channel radio receivers and transmitters has enabled modellers to construct miniature remote-controlled aircraft of amazing performance and versatility. Their ability to carry out some of the functions of full sized piloted aircraft at a very small fraction of the usual cost has resulted in their being used in a number of intriguing ways: for example, they have been used successfully for photographing the dispersion of effluent from factories in river systems (Anon. 1976); for sampling air over cities and industrial areas to determine pollution levels at different altitudes; for aerial spraying of insecticide over small control areas; and, in a most interesting guise, for scaring birds away from airport runways. The latter example occurred at Vancouver International Airport where a model aircraft, designed to resemble a hawk, was used with some success to frighten away large numbers of birds which posed a threat to aircraft landing and taking off (Anon. 1975).

The model system described in this report was developed from a need to count and study the behaviour of marine mammals at times of the year when they congregate in large numbers, often to bear their young. The remoteness of some of the localities involved, the need for repeated counts, often several times daily, and the inevitable budgetary restraints, precluded the possibility of chartering a full-sized aircraft for the amount of time required.

During the summer of 1977 the model was used at Cunningham Inlet, northern Somerset Island, NWT to photograph a herd of beluga or white whales (Delphinapterus leucas) which are known to concentrate in the Cunningham River delta every summer from mid July until mid August.

THE MODEL SYSTEM

Aircraft

A careful assessment of design characteristics and practical experience of the performance suggested the Senior Telemaster as a suitable prototype. The model was purchased in kit form and was constructed at our laboratory. Only a few modifications were required to the original plan to allow for the vertical mounting of the camera in the fuselage. The kit used was of German manufacture but is no longer being produced; however, a similar kit of American manufacture is readily available (Hobby Lobby, Brentwood, Tn, U.S.A.).

The Senior Telemaster (Fig. 1) has a wingspan of 2400 mm and a fuselage length of 1605 mm. The dimensions of the vertical fin and stabilizer are 270 mm high X 240 mm wide X 880 mm long. Total weight including all radio and camera equipment and engine is 5.9 kg.

Camera

The camera used was a 35 mm Olympus OM1 with motor drive. This was chosen as it is the smallest, most lightweight camera for which a compact motor drive unit is available. Both 50 mm (standard) and 24 mm (wide angle) lenses were used. A special triggering arm was built into the fuselage of the aircraft to depress the shutter release on command from the radio transmitter. Shutter speed was set at 1/500 sec. for maximum clarity, and the lens opening was set according to light conditions. Focus was set at infinity as all exposures were taken at an altitude in excess of 60 metres.

Film type used was 36 exposure Ektachrome 200. Exposures could be taken at any desired interval as fast as 1 exposure per second with the motor drive control set on manual. With the control set on automatic, a 36 exposure roll could be taken in less than 10 seconds.

The camera was mounted on foam rubber blocks to minimize vibration from the aircraft engine.

Radio Control System

The radio control equipment (Futaba, Model FP-6FN) consists of a 6 channel proportional transmitter with enclosed battery pack, each channel capable of performing one function; a six channel receiver, placed in the aircraft fuselage; a separate battery pack for the receiver which is also placed in the fuselage and connected to the receiver with a removable wire harness; and 5 servo motors connected to the receiver with wire harnesses, each performing one control function. Five radio channels were used, 1 for camera operation and 4 for aircraft control (ailerons, elevator, rudder and throttle). The effective range of the radio system was in excess of 1.5 kilometres.

An a/c power source such as a small portable generator (Honda 300) is required to charge transmitter and receiver batteries. All batteries used in the radio system are rechargeable nickel-cadmium type. Battery life between charges is about 1½ hours.

Engine

The engine is a standard 2 cycle, 1000 mm^3 displacement glow-plug type model aircraft engine (O.S. Max. 60 FSR) with throttle control, producing 1.7 h.p. at 16,000 rpm. Engine speeds range from 2000 rpm (idle) to 14,000 rpm, turning a 300 mm propeller. A 500 ml fuel tank allows an engine running time of 30 minutes. The engine can be shut off at any time on command from the transmitter.

PERFORMANCE AND PROBLEMS

The aircraft performed extremely well and no problems were experienced with the flight controls or the camera control. One of the problems encountered was in finding approximately 50 m of relatively level ground suitable for take-off and landing. The only area available was about 1 km from the main concentration of belugas, which necessitated having a man with binoculars stand beside the controller at all times. In the event that the controller might lose sight of the aircraft, the man with the binoculars could describe its position, altitude, attitude, and direction of travel. Another man stationed close to the whale concentrations was in radio contact with the controller, and could tell him when the aircraft was in a position where exposures should be taken.

Weather conditions, including low ceilings, fog, rain, and gusty winds, greatly affected the operation of the aircraft. The aircraft was not flown when wind speed exceeded 30 km/h.

Another problem encountered was in maintaining the same altitude for the period of time during which photographs were being taken. It is difficult to judge aircraft altitude from the ground, particularly at long range, and if several passes were necessary to photograph the whole area or concentration of animals, differences in altitude of + or - 20 metres could be expected on each pass.

RESULTS

High altitude photos (300-350 metres), using the wide angle lens, enabled us to photograph the beluga concentration in the river delta, these animals making up about 90% of the total number of belugas in the inlet. Small groups of animals could always be seen 3 to 5 km from the delta and were out of range of the aircraft. Some high altitude photographs were taken through thin cloud patches under 300 m, which were not visible from the ground. These photos tended to be fuzzy and clarity was not good. However, sufficient exposures were made between these patches of cloud to enable accurate counts of all animals in the delta to be obtained.

Lower altitude photos (150-200 m) using the standard 50 mm lens enabled us to determine the percentages of adults, immatures, and new-born young in the herd. Clarity and detail from the lower altitude photos were extremely good (Fig. 2).

Little, if any, disturbance was caused by the model aircraft flying at 150-200 m over the animals since no abnormal behavior was observed during or after the flights. Much disturbance was caused when full-sized aircraft flew over the herd at an altitude of about 300 m. On several occasions when flown over by full-sized aircraft, the herd was observed to disperse immediately, most animals leaving the inlet altogether. After this type of disturbance the herd did not return to normal size for a period of up to 2 days.

As expected, the behavior of animals is difficult to ascertain from still photographs. However, the photographs showed that adult animals (probably females) with young tend to segregate from adults (probably males) not accompanied by young.

CONCLUSIONS

The model system has proved to be of value in counting marine mammals and estimating the proportions of easily discernible age classes. It was also developed to study the spatial distribution of the polygynous land-breeding grey seal (Halichoerus grypus), but has yet to be tested in this capacity.

Its application to the study of other gregarious animals in remote locations, such as colonial seabirds, is deemed worthy of trial.

ACKNOWLEDGEMENTS

We would like to thank R. Greendale, W. Hoek, and D. W. Doidge for their assistance in the field.

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Fig. 1. The aircraft being prepared for take-off on a level gravel bar (photo: R. Greendale).

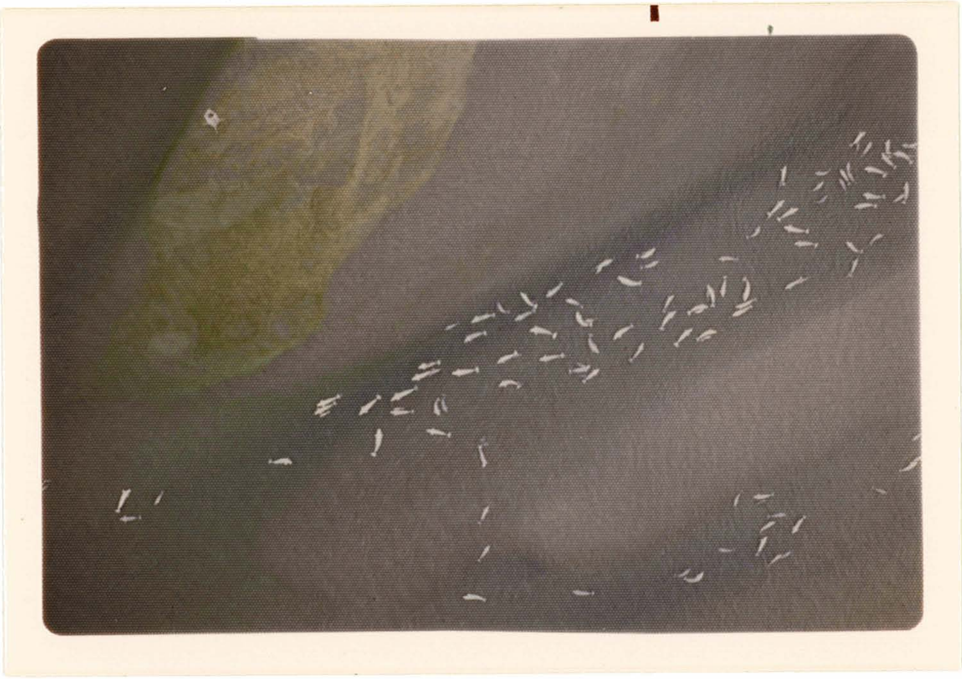

Fig. 2. An aerial photograph taken from about 150 m showing part of the beluga herd.