

PREDICTIONS OF THE SPRING MIGRATION OF SNOW GESE ACROSS THE
TERMINAL CONTROL AREA OF WINNIPEG INTERNATIONAL AIRPORT.*

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SUMMARY

1. The chronology of spring migration of Lesser Snow and Blue Geese (snow geese) in the vicinity of Winnipeg was determined, the influence of the weather was examined and the results were used to develop a method for predicting major flights (waves of migration).
2. Records of visual observations of migrating snow geese for the period 1953-69 were obtained from several sources.
3. Visual observations of staging geese during 1970, 1971, 1972 and 1974, confirmed that the majority of snow geese in southern Manitoba concentrated between Cartwright and Windygates, with the largest numbers near Pilot Mound, Crystal City and Snowflake.
4. In the springs of 1970, 1971, 1972 and 1974 time lapse films were made of the scope of the AASR-1 surveillance radar at Winnipeg International Airport. Visual observations confirmed that the great majority of "goose echoes" were caused by migrating flocks of snow geese.
5. Twelve (52%) of the 23 waves during the 1953-69 period occurred in or just ahead of a warm sector, near or on the east side of an occluded front, or on the west side of a high. The other waves occurred under a variety of synoptic weather conditions.
6. Direction and speed of the surface wind and precipitation

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at Pilot Mound, precipitation, direction and speed of the surface wind at Winnipeg, and direction of the geostrophic wind over Winnipeg were significantly related to the progression of the migration season.

7. These nine weather factors were used in a simple model to predict waves of spring snow goose migration for 1970, 1971 and 1972.

8. All predictions were based on weather reports rather than weather forecasts. Predictions for 1970 were checked against the 1970 radar data. Weather factors that caused large errors in the predictions were omitted or modified, and the revised model was used on the 1971 data. The model was further revised and used on the 1972 data. The following five weather factors appeared most useful for predicting spring migration: direction of surface wind and precipitation at Pilot Mound, and direction of surface wind and of geostrophic wind and precipitation at Winnipeg.

9. The accuracy of the migration predictions improved for each year and for 1972 85% of all hours of actual heavy migration were predicted, while 75% of all hours of predicted heavy migration materialized.

10. In 1974 this theoretical prediction model was used at Winnipeg International Airport to prepare operational migration predictions. Predictions were either "heavy migration" or "non-heavy migration". These predictions were based on weather forecasts (not on weather reports as was the case for 1970-72)

and were issued to Air Traffic Control each day at 0600, 1200 and 1800 hours. The overall accuracy of those predictions was 79%, but was much lower when only heavy migration was considered.

11. The accuracy of the prediction model for the spring 1974 migration was determined using weather records. Of the 49 hours of heavy migration, 38 hours (78%) were predicted while of the 72 hours of predicted heavy migration, 38 hours (53%) materialized. The accuracy of the prediction model for the spring migration of 1974 was lower than that for 1972.

12. Inherent shortcomings of the migration prediction model and difficulties in using the model with the terminology of weather forecasts make it advisable to revise the prediction model prior to further use. This revision would have to be preceded by a new analysis of the data obtained so far using multi-variate statistics.

13. Operational usefulness of migration predictions for flight safety is limited because of the variability in the numbers and distribution of the migrating geese and in their response to weather changes. Even an improved migration prediction model with greater accuracy would only warn or alert pilots and air traffic controllers in a general way. A real-time operational system to prevent collisions during climb-out and descent would require additional information on the three-dimensional distribution of the bird flocks.

14. An automatic system, based largely on radar, would provide

information on all actual hazardous situations created by airborne birds of any species in sufficient detail to estimate bird strike probabilities. Further research and development work on such a "bird radar" is recommended.

DOCUMENTATION

- Blokpoel, H. 1974. Migration of Lesser Snow and Blue Geese in spring across southern Manitoba. Part 1: Distribution, chronology, directions, numbers, heights, and speeds. Can. Wildl. Serv. Rep. Ser. 28, 30p.
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- Hunt, F.R. 1973. Probability of a bird strike on an aircraft. Field Note 62, Associate Committee on Bird Hazards to Aircraft, National Research Council of Canada, Ottawa.
- Hunt, F.R. In preparation. Automatic radar equipment to determine bird strike probability. Part I. Night-time land bird migration; Part II. Flock migration.

* Copies will be available at the meeting.