

New procedures for evaluation of radar information

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1. Present bird warning system in Germany

Migratory movements of birds are observed continually by use of surveillance radar equipments. To distinguish the bird echos from other targets there are made long exposed polaroid photos of the radar screen. The photos are compared with the international 0 - 8 scale for estimating the bird intensity. If the migration has reached an intensity ≥ 4 a bird warning message is transmitted to the GMGO. After an evaluation of the message especially with regard to the warning height and validity a birdtam will be transmitted by teleprinter over the geophysical and air traffic control network. The time between the observation and the beginning of validity generally takes 1/2 to 1 hour. The areas/heights specified in the birdtam are restricted for military jet aircraft.

2. Experience with the birdtam system

The problems with the photographic registration of bird echos are well known:

- (i) If the employed types of radars are different, the results cannot be compared exactly.
- (ii) The resolution of the radar depends strongly on the used type of indicator and video processing.
- (iii) The interpretation of the photos differs, when judged by different persons.

In spite of these disadvantages the German birdtam system had good success in several migration periods as shown in fig.1. During October 1976 the number of birdstrikes could be reduced by birdtam though bird migration reached its highest intensity. In other years however the results were not convincing. The most important factor is the varying quality of radar observation in different years/areas.

Fig.2 shows the frequency of birdtam concerning different GEOREF-areas in 1973. The main part of flight restrictions in NW-Germany and East-Bavaria does not reflect the real

birdstrike risk in the whole country, but should be ascribed to chance. If flight restrictions by birdtam shall be justified, a rather homogenous network of observations will be necessary. This demand refers also to informations about the height distribution of bird migration. With the surveillance radar there is generally a gap of information at levels below 1000 ft AGL. Moreover hight finder measurements have an inaccuracy of ± 1000 ft. As the main part of bird migration occurs in heights below 2000 ft AGL an exact specification of the height is unrealizable. Unfortunately these heights are the operational space for military low level flights. Fig.3 shows the monthly distribution of birdstrikes in heights below 500 ft AGL, between 500 and 1500 ft AGL, and above 1500 ft AGL. As high level migration mostly does not correspond to low level migration, birdstrikes at lowest levels cannot be avoided by radar observation.

Finally there exists an operational problem of the present birdtam system. As birdtam must be based on real observations of bird migration, they are immediately valid and cannot be considered for flight planning. Therefore a birdtam often causes trouble at the flying units.

3. Improvements of the bird warning system

The disadvantage of the photographic system can be avoided by using an objective electronic counting system for radar echos. But the main problems of the warning system will be still existing. An improvement seems only possible by (i) a thorough evaluation of the radar data/photos/films on hand, and (ii) an evaluation of the actual radar information before issuing the warning. Work on these items has been started in the GMGO.

- (i) Since 1970 the GMGO has gathered thousands of polaroid photos and has evaluated many kilometers of radar films. Fig.4 shows the fragmentary knowledge gained by radar observation. Only in relatively small areas the coverage of bird migration is satisfactory. In other parts there is a considerable gap of information. If e.g. bird movements occur in the lower part of fig.4 there is only a small chance for detection.

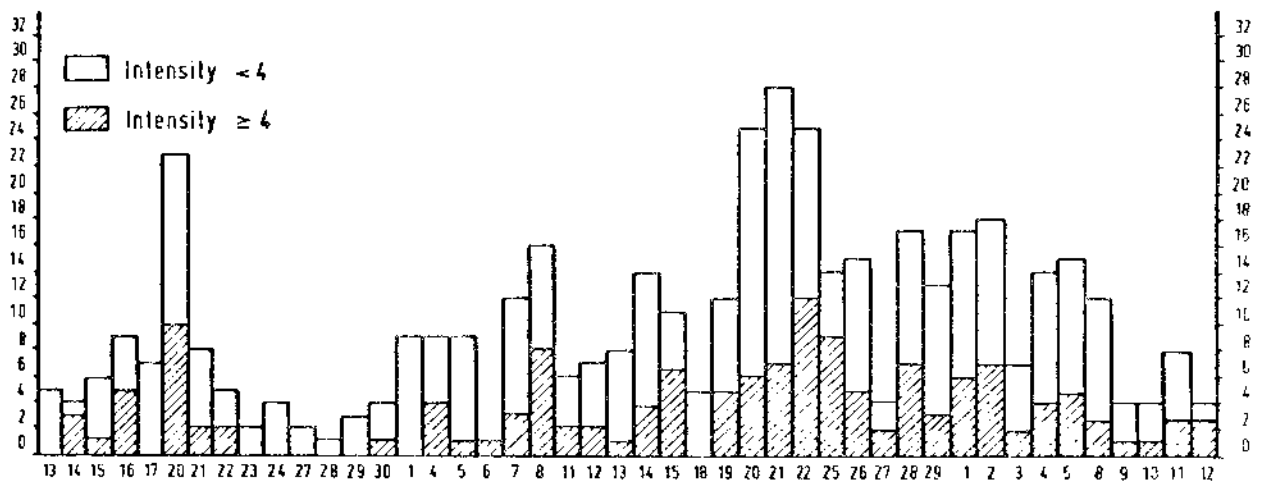
These gaps have to be filled by other data, e.g. the dimensions of bird migration in a certain area and time, visual observations, and weather influence. Using electronic data processing predicting models for the intensity of bird migration in different parts of the country are possible.

- (ii) The results of these evaluations are significant for the actual warning procedures. They allow to judge the actual radar informations, and to complete or extend the message if necessary. Comparing the radar information with other bird warning messages (also visual ones) the area covered probably by bird migration can be limited. This procedure is important for operational purposes, because the restricted area should be as small as possible. On the other hand the birdtam should cover the whole space of bird migration.

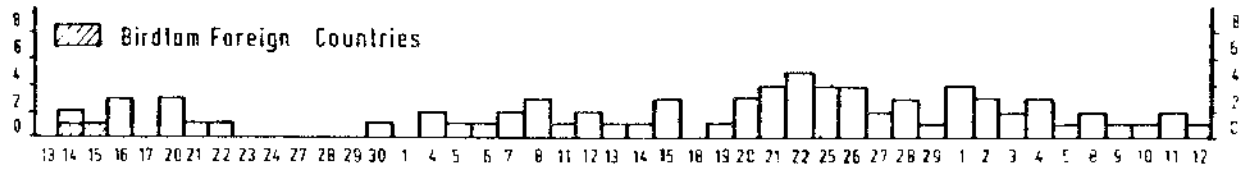
An improvement of the bird warning system is considerably depending on our knowledge about concentrations of bird migration in time and space. One single radar observation does not allow to judge the extent of bird hazards. Bird warning messages or birdtam could be rather formulated, if the observation can be included in a greater context.

BSCE 14 / WP 13 / Fig. 1

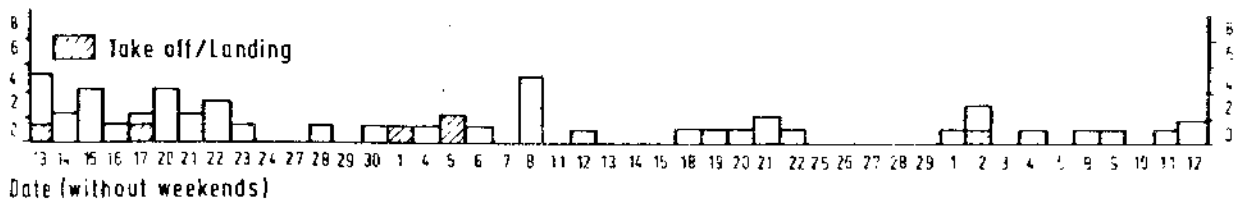
Bird Warning Messages (Radar/visual) 13.09.1976 - 12.11.1976



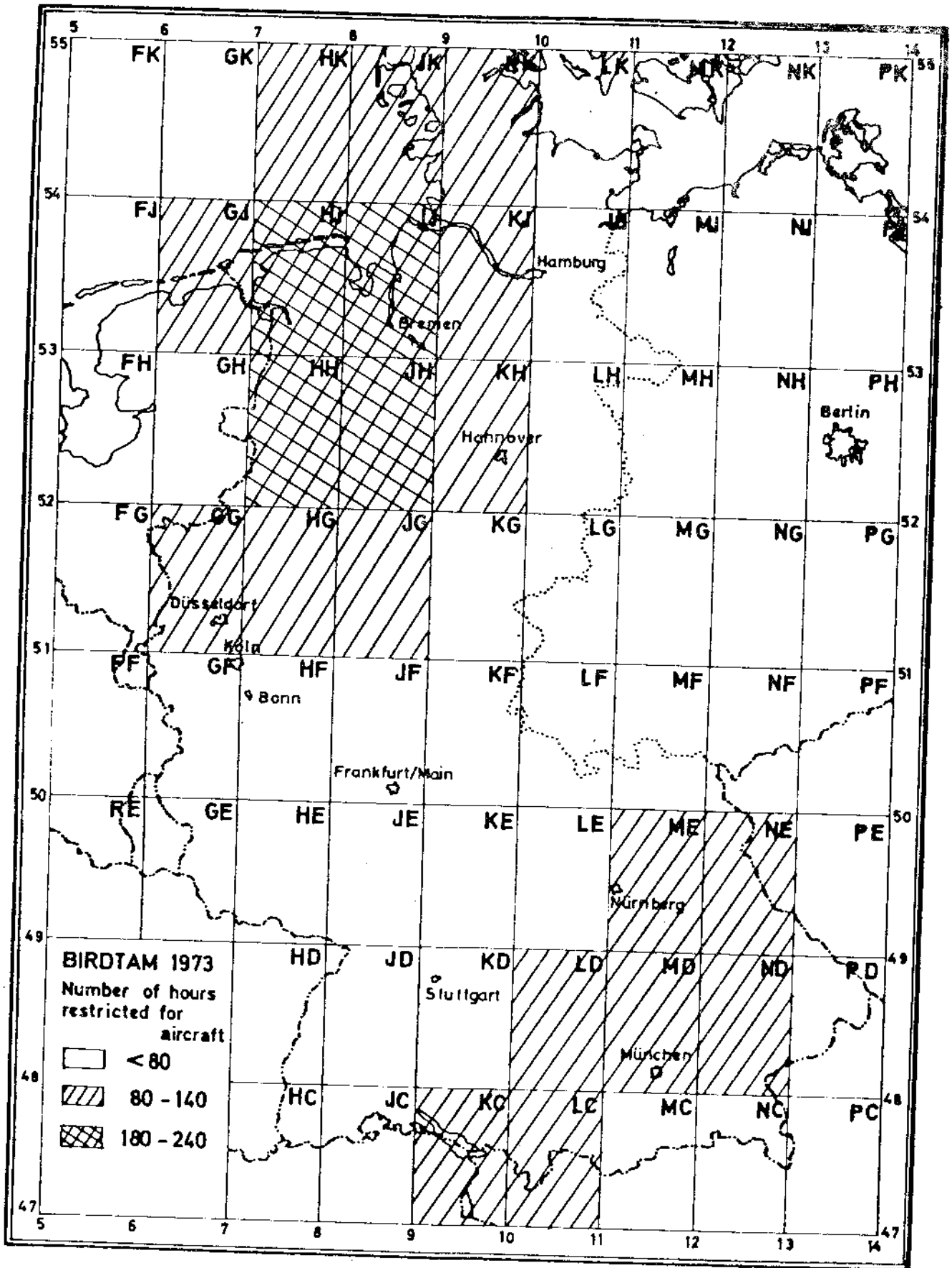
Birdtam 13.09.1976 - 12.11.1976



Birdstrikes 13.09.1976 - 12.11.1976

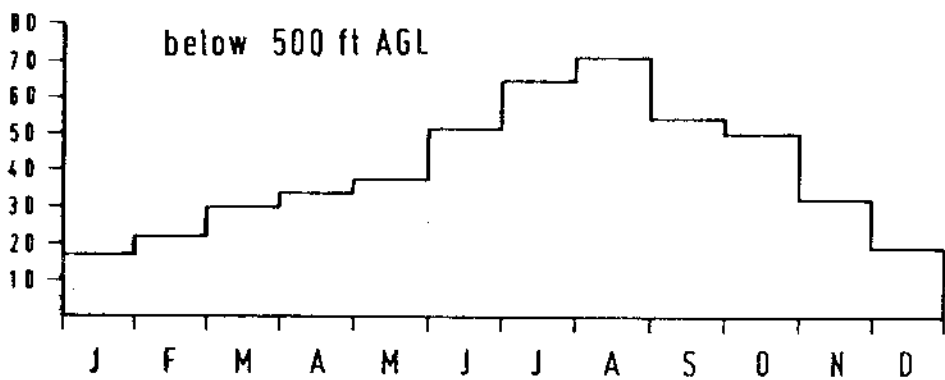
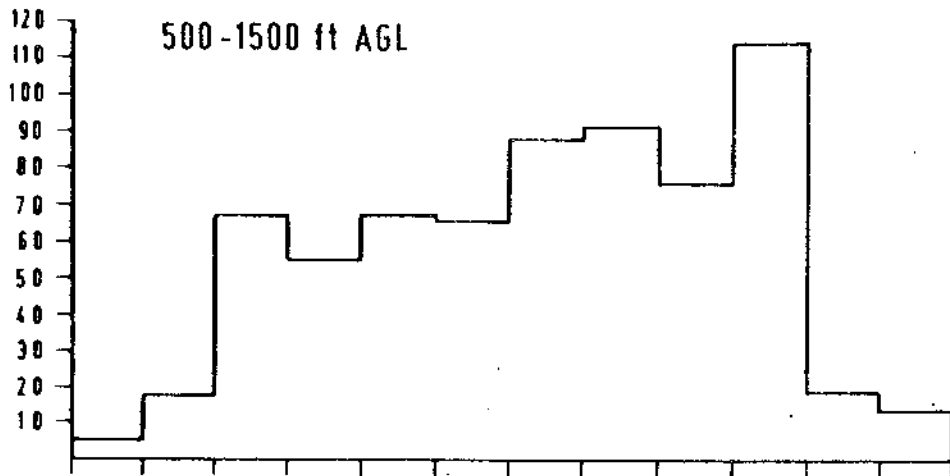
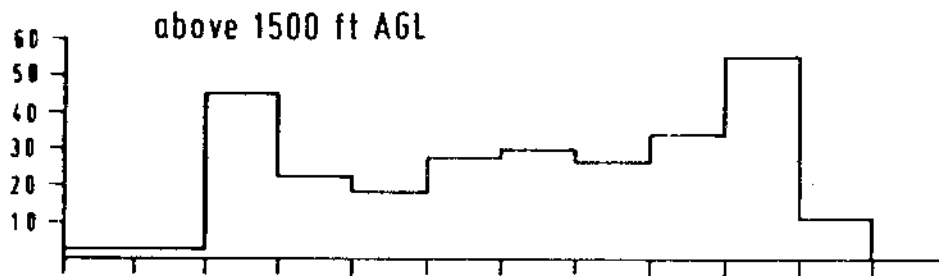


BSCE 14/WP 13/Fig. 2



BSCE 14/WP 13/Fig. 3

Monthly Distribution of Birdstrikes 1971-1977
in Different Flight Levels



BSCE 14/WP 13/Fig.4
Coverage of Bird Migration
by Long Range Surveillance Radar

