2.16.Bird-Airplane Collisions at Low Altitudes – Planned Preventive Actions of the Swedish Air Force.

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by

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The Swedish Air Force spends annually well over 100,000 hrs in flights. The increased rate of bird-collisions during the last decade, owing to the one of faster and more advanced types of aeroplanes has led to the bird-strike problem being one of the most important tasks for the Flight Safety Department to solve.

Following many other countries a first step was taken in summer 1971, when a scientifically-trained ornithologist was employed to investigate the problems. Since then the situation in recent years has been intensively studied and investigation projects started.

During the last five years, the Swedish Air Force has registered annually 130-200 bird collisions. The rate has continuously increased, probably owing mainly to growing awareness of the problem, but partly owing to a real increase of collision frequency. This is illustrated by the number of collisions leading to damage ranging from 12 to 29 during the last years, and also showing a rising tendency. The direct economic losses have amounted to $50,000 – 100,000 annually, but more important two men (pilot and navigator) have been killed in one accident and two aeroplanes have been totally lost (b since 1962).

The collisions could be classified as happening in either of three distinct phases of operation, in connection with take-off or landing at or very close to the airfields and finally in connection to other operative flights mostly not in the vicinity of airfields. It was found that 65% of all bird-collisions during the last five years occurred during this last mentioned phase of operation and the collisions leading to damage 75% occurred in this phase. This pattern is found also for other Air Forces and sharply contrasts to the bird problems of the Civil Air Traffic, where the collision risks are concentrated to the immediate vicinity of the airports. This is of course owing to the different cruising altitudes, and the Air Forces often operates at low altitudes.

The investigations started and measured planned at airfields will not be connected upon in this context.

Data on the altitudinal, seasonal, geographical, and diurnal pattern of collisions at the operative flight phase are presented below.

The counter-measure planned to be taken and presently under intensive research are three, briefly commented upon below.

1. Restrictions of low-altitude flights. At present the lowest permitted altitudes of military flight in Sweden are 10 m over sea and 20m over ground. The geographical distribution of bird collisions was only to a small extent found to be correlated with high bird concentrations, but bird-collisions areas were mainly found in areas with frequent low-altitude operations. This does not imply that birds could be regarded as randomly distributed in air space, but merely that risks at extremely low altitudes of flight are very high. General restrictions have therefore been proposed mainly in southern Sweden.

2. Radar used as a direct warning system. Radar is to a rapidly growing extent used as a direct warning system, where most commonly bird intensity is given in a 8- or 10-point intensity scale evaluated from Polaroid photography of PPI's. It is however surprising, that very few methodological studies, especially concerning diurnal bird movements, have been carried out. In order to study the significance of radar bird migration, simultaneous PPI-filming from different radar stations in the same area and field studies have been made in southernmost Sweden. A pilot study was made in spring 1971 and in autumn 1971 a three-week-bird-migration study by radar – and field recording was carried out. A similar two-week study took place this spring and further studies are felt to be urgently needed. Most interesting was the picture of diurnal autumnal bird migration obtained from 1/a 600KW S-band station without MTI-equipment operated at a range of 56km (30NM), 2/a 1,8 MW L-band station with MTI-device operated at a range of 135km (75NM), and finally 3/ field recordings of visible migration from 5 observation sites.

The following general conclusions could be drawn:

a/ Small bird migration at radar was best studied from the S-band station, owing to large sensitivity at the S-band station to the MTI-system and radar adjustments. Thus, the small echoes were much less obtrusive at the L-band station.

b/ Migration of large birds such as Wood Pigeons, Anseriformes and Charadriiformes was more readily observed from the L-band station. The MTI-device had bery small suppressive effect on these large, distinct and fast echoes. At the S-band station the great mass of small echoes often made separation of large echoes impossible.

c/ Good correlation was found between migration of Wood Pigeons and Elders, which often dominated among migration large birds, as seen on radar screens and noted in the field.

d/ No correlation was found between visible small passerine migration (mainly Chaffinches) and small echo movements on the radar screen.

While the conditions revealed for large birds seem promising for radar warning use, a model was set up for small bird migration (Chaffinch migration) which must be further commented upon. High-flying finch, flocks, only recorded by radar, seemed to fly on constant heading (SSW), not compensating for wing displacement. Large numbers of birds tended to migrate when tracks and heading coincided i.e. with tailwinds.

Low-flying birds, noted by field observers but not by radar, compensated for wind drift but often deviated conspicuously from preferred track owing to the influence of leading lines. Large numbers tended to migrate with moderate headwinds.

It should be stressed, that it seems by no means self-evident that high-flying bird flocks consisted of larger numbers of birds than those at low altitude. Remembering that many bird-collisions occur at extremely low altitudes (100m), these general conclusions mean that the significance of radar warning systems in some cases may be questioned. Using an appropriate radar station, movements of large birds could effectively be warned against. The biological results of the study in autumn 1971 will be published as two reports from Falsterbo Bird Station, the Ornithological Society of Skåne.

Alerstam & Ulfstrand: Diurnal Bird Migration over Skåne, Sweden studied by radar and field observations 1971-09-21-1971-10-10

Alerstam: Nocturnal Bird Migration over Skåne, Sweden as recorded by radar 1971-09-24-1971-10-10

3. Prognosis-system for bird migration. With the knowledge of seasonal and diurnal pattern of migration of different bird species, the current weather situation should be used in making a bird-migration prediction. Extensive field notes exist from Swedish Bird Stations and primarily a 10-year autumn material from Falsterbo Bird Station will be used and correlated to weather using multivariate statistical techniques. Some exciting progress has earlier been made in this field (Nisbet & Drury 1968: Short-term Effects of Weather on Bird Migration: a Field Study usinf Multivariate Statistics. Anim. Behav. 18: 456-530).

The reasons for using field material instead of radar data are: a/ that not enough relevant radar data exist but primarily owing to b/ the importance of low altitude bird movements in connection with bird

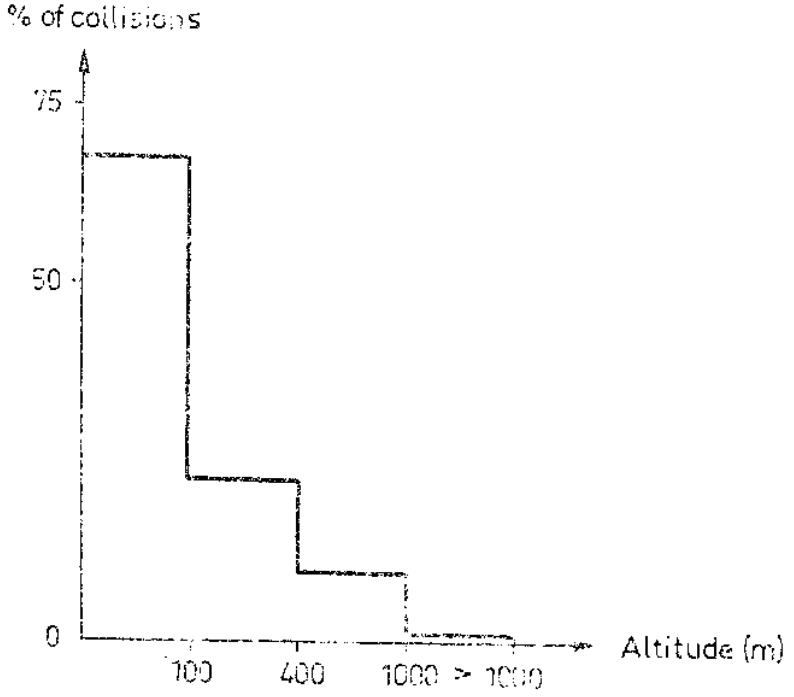
hazards to aircraft (see discussion above) and c/ the possibility of treating different species separately. It is highly probable that different bird species respond differently to varying external conditions, and radar does not elucidate such differences as species identification is impossible. The functional and biological aspects are considered to be very important as greater understanding of these aspects may permit a widened use of the results. Simultaneous radar and field studies give information necessary for the statistical treatment of visible migration. The developed forecast-system is intended to be used as a routine at the airports, connected with specific restrictions at expected intensive bird movements.

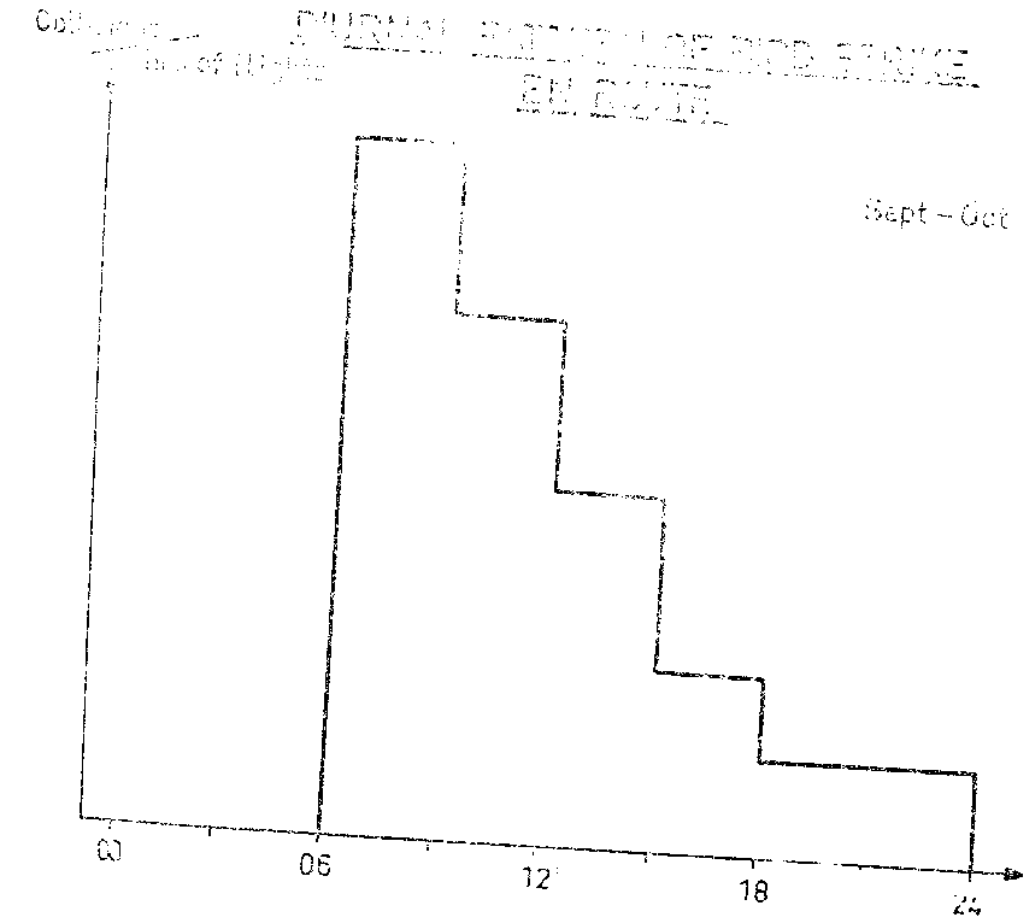
The Swedish Air Force is working on the problems discussed above in cooperation with The Ornithological Society of Skåne and the Civil Aviation Board of Sweden.

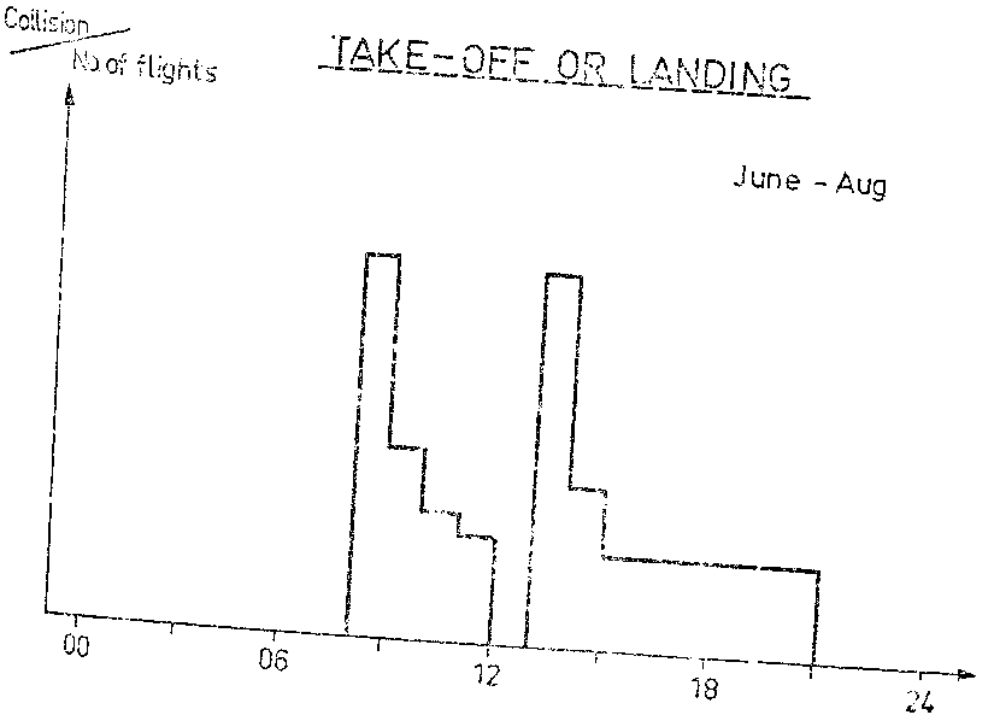
EN ROUTE BIRD STRIKES 1957 - 1974

• 5 collisions
· 1 collision

EN ROUTE BIRD STRIKES AT DIFFERENT ALTITUDES




Sept – Oct
00
06
12
18
24


Collision
No of flights
TAKE-OFF OR LANDING
June - Aug
00
06
12
18
24

BIRD STRIKE RATE EN ROUTE IN DIFFERENT MONTHS.