

## NEW DEVELOPMENTS FOR IMPROVING THE GERMAN BIRDTAM/BIRD- STRIKE WARNING SYSTEM

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### ABSTRACT

The actual state of the German BIRDTAM/BIRDSTRIKE WARNING system is presented, since some significant changes have been carried out during the last years. The so far manual system has been changed into a widely automated system. Database and dataprocessing are briefly explained as well as the new bird migration observing system used at air defence radar stations. Main emphasis is concentrated on the BIRDTAM/BIRDSTRIKE WARNING - System and BIRDTAM generation algorithm, resulting in new output standards. Advantages of the new system are discussed and future plans are outlined.

(Keywords: BIRD STRIKE, BIRDTAM, NEW DEVELOPMENTS)

## 1. Introduction

In contrast to civil aviation military aviation is much more affected by birdstrikes during flight missions outside aerodromes and airfields. Low level flying and high speed flying cause about 2/3 of military birdstrikes each year. Efforts to reduce birdstrikes have to concentrate on an efficient online bird migration warning system besides an optimal habitat management on airfields. The German Military Geophysical Service is operating a bird migration warning system (App.1) for now more than 20 years which has proved to reduce birdstrikes significantly. New techniques in data processing have made it possible to change the so far manual system during the last years into a widely automated system in order to achieve a higher degree of efficiency and convenience in handling.

## 2. Database and Dataprocessing

The main input into the warning system are actual messages of bird migration observations from the German bird migration observation network, bird messages from pilots and bird warning messages from neighbouring countries. The German observation network consists of 8 air defence radar stations, about 15 ground control radars at airfields and about 200 observing posts at meteorological stations.

The most reliable observations concerning broad front bird migration are those from air defence radar stations. These observations are carried out regularly, following a fixed time schedule. The observing technique until present has been a long time exposure photo with a Polaroid-Camera fixed in front of the radar scope. This system became more and more ineffective due to mechanical defects and manual inconvenience. Since summer this year this system is about to be replaced by a new computer based system (App. 2). It uses a video camera connected to a standard PC. The system video-digitizes the radar scope several times per revolution over a period of about 10 minutes followed by an image processing algorithm. According to the shape and size of the track signals and main direction of the tracks the program decides about potential bird migration and gives an alarm signal together with a plot of the actual analysed image. The radar controller has to finally interpret the output, decide on the intensity, direction and location of bird migration and send the message.

Observation data are routed to the adjacent meteorological station, where they are feeded into the meteorological telex network in a fixed format. All data are then routed to the German Military Geophysical Office at Traben-Trarbach (App. 1). Additionally the Bird Warning Messages arrive there via Aeronautical Fixed Telecommunication Network. Ornithological Data are separated from other Data by the Main Data Transfer Computer (FMZ) and are routed into the Geophysikal Forecast Computer (GEOVOR).

### 3. BIRD TAM Algorithm

All relevant data are processed in the GEOVOR-Computer by the overall Software package COBIBE (COMputerunterstützte Biologische BEratung). This System provides the options:

- interactive handling off all relevant data
- automated filing of data
- data analysing
- automated filing of all system actions
- software maintenance and development
- automated BIRD TAM generation

The BIRD TAM system is the first operational automated system of further planned improvements of biological guidance systems, like the BIRD STRIKE RISK FORECAST which is based on meteorological and ornithological parameters.

The BIRD TAM - Algorithm (App. 3 and 4) first decodes all observation messages automatically. Not correctly formatted messages are corrected as far as possible. Those messages that are not correctable by the software itself cause a message, which is send to the geophysical forecast center, where the message is corrected or cancelled and routed back into the algorithm . This method provides a maximum of usable data input.

All decoded messages are transformed into a basic BIRD TAM data set, that way, that the area of flight restriction is defined, intensity is set and similarly the warning height and time of validity are attached. In contrast to former regulations this does not cause a BIRD TAM/BIRD STRIKE WARNING message immediately. Instead, these basic data sets fill a data file, which is emptied in defined time intervals (usually every 15 minutes). After emptying the basic data file the data sets are ranked and added to the existing valid BIRD TAM situation. The new BIRD TAM situation is then harmonized using spline algorithms for

- Area
- Intensities
- Heights
- Validity

in order to achieve an optimized BIRD TAM situation. After these procedures have been carried out, the new harmonized BIRD TAM situation is compared with the so far valid situation and the difference between the two forms the new BIRD TAM which is automatically generated and routed to the main telecommunication computer from which the message is distributed to the users.

### 4. New BIR

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### 5. Future Pr

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#### 4. New BIRDTAM Messages and Displays

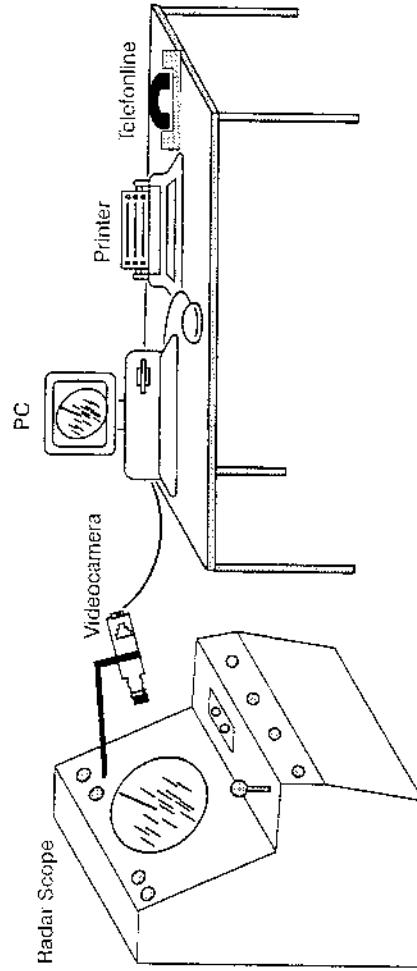
The BIRDTAM - message format has been laid down by the international STANAG - agreement. It guarantees that BIRDSTRIKE WARNINGS are to be understood in every country, that follows this standard. For practical purposes however, this message form is difficult to handle. Especially when a large area like central Europe is considered. For pilots and people providing briefings to the pilots, the BIRDTAM - situation is difficult to overlook. Particularly during times of severe bird migration too many messages give a confusing picture of the actual situation.

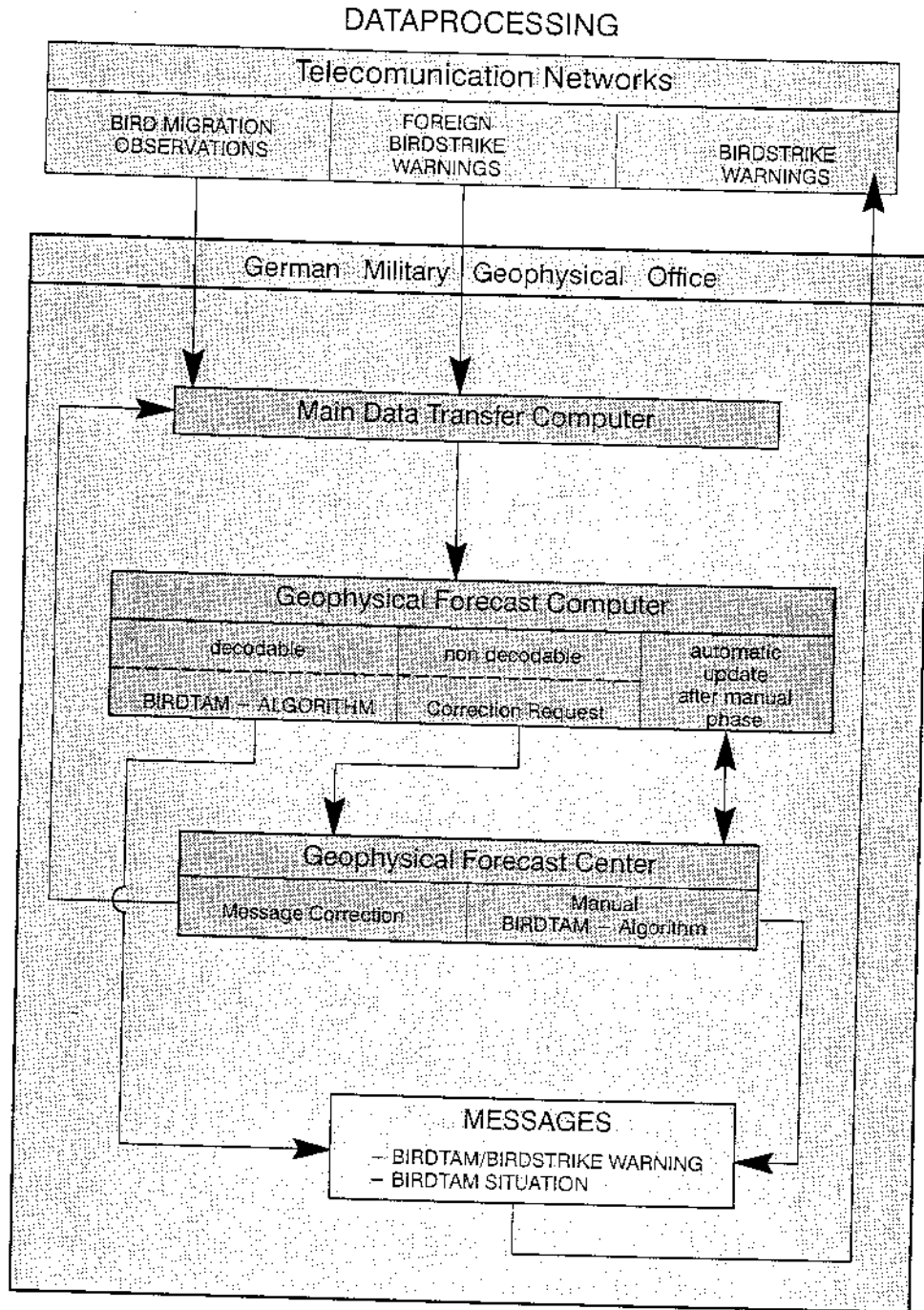
Therefore, apart from the official BIRDTAM format, which is useful for the international exchange of BIRDSTRIKE RISK information, the BIRDTAM working group within the GMGO has invented new telex reports. The new algorithm made it necessary to use the extended STANAG format (App. 5) with more than one intensity and area. Additionally a new telex report is being used since about two years now, providing a summary of all valid BIRDTAM/BIRDSTRIKE WARNINGS. It is automatically generated and distributed in the German military geophysical telex network every time a new BIRDTAM is delivered. This report has now been improved and is about to be replaced by a quasigraphic alphanumeric chart, showing the BIRDTAM - active - areas in the GEOREF - grid (App. 6). Attached to it is a legend with the exact information: intensity, validity, height and the status, whether an active area has been added or enlarged. The new report is also automatically generated and sent if it has been requested for, so that a briefing person or a pilot is able to get an actual plot of the present BIRDTAM - situation whenever it is needed. The advantage of these new message forms is that they significantly reduce confusion about active areas or validities and increase the acceptability of the BIRDTAM/BIRDSTRIKE WARNING - system as a whole.

#### 5. Future Program

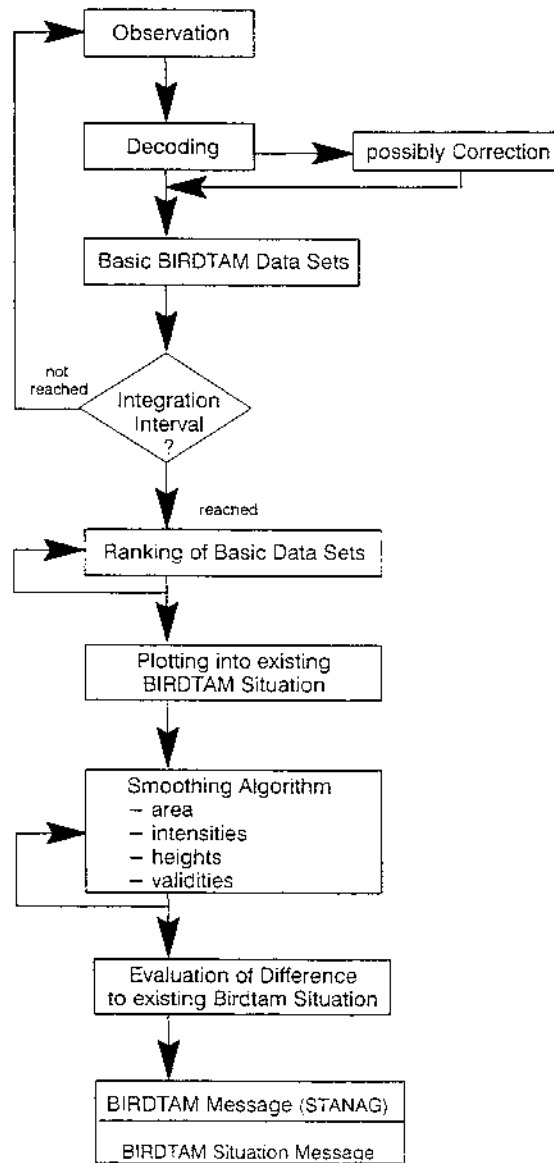
For the future main emphasis will be concentrated on the radar observation system. The new PC - VIDEO - System has to be calibrated carefully for each site. First tests have been carried out with a new pencil beam air defence radar, providing 3-D bird migration information. A more efficient data collection is attempted, using MODEM - connections between radar stations and the GMGO. Additionally new geophysical information systems at airfields, developed by the GMGO, will allow new real graphic displays of the BIRDTAM - situation in combination with other flight affecting parameters.

Automatic Bird Migration Observing System





## New BIRDTAM – Algorithm



### Extended STANAG BIRDAM - Format

```

WXDL52 EDZX ddhhmm
BIRDAM/BIRDSTRIKE WARNING nnnn A) EDZX B) ddhhmm C) ddhhmm
D) i E) g1,g1,g1,g1,g1----- F) SFC G) hhhh
D) i E) g2,g2,g2,g2,g2,g2,g2,g2,g2,g2,g2,g2,g2,g2,g2,g2,
g2,g2----- F) SFC G) hhhh
:
:
D) i E) gn,gn,gn,gn,gn----- F) SFC G) hhhh=

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