BIRD STRIKE RISK ASSESSMENT
FOR
ATHENS INTERNATIONAL AIRPORT

Anastasios Anagnostopoulos
Environmental Department, Aviation Services Division, Athens International Airport S.A.
Maintenance Building (11), SPATA 190 19, Hellas
Tel: +30 210 3536 671, Fax: +30 210 3537 800
Email: tasos.anagnostopoulos@aia.gr

Abstract

The documentation procedures of a well-designed and comprehensive Bird Control Programme can provide to the responsible officers a significant amount of data related to the various issues of the programme. Bird species, numbers and activities either on the airport or in the near vicinity, attributes related to bird carcasses, the use of the runways or aircraft movements per type, and weather conditions are some of the data that can be utilised by the Risk Assessment and Management studies.

With the use of a comprehensive database and ArcView GIS, Athens International Airport transforms quantitative and qualitative data collected during the implementation of the Bird Hazard Control and Reduction Programme to a multi-layer GIS (Geographical Information System) environment. Through this process two main goals are achieved:

- Decision-making is supported during the Risk Assessment process
- A monitoring tool to assess the effectiveness and results of the Risk Management procedures is provided.

Key words: bird hazard control, bird strike, risk assessment and management, Geographical Information System, Athens International Airport, Hellas

1. Introduction

The use of Safety Management Systems (including Environmental Management Systems) for hazard identification and management and risk definition is becoming a necessity world-wide. The aviation industry includes many risks; therefore, early in its development Risk Assessment and Management Programmes are continuously being performed with a range of subjects varying from a single nut to aircraft engines and from airport installations to personnel involved in aviation.

Bird strikes have been identified since the 60's as an increasing risk for aviation. During the various periods of the development of the aviation industry (e.g. development of new aircraft, engines, airports, etc.) the components at the right part of the equation:

Risk = Exposure X Probability X Severity

have been subjected to re-assessment on the basis of the most up-to-date methodologies of the respective period.

Analyses of statistical data involving bird activities and bird strikes, definition of stakeholders and their responsibilities risk chains, matrices defining tolerability, and many other tools have been used for assessing risk and designing effective management programmes.

Recently Geographical Information Systems (GIS) have been introduced to visualise risk levels and provide help to reduce them (e.g. the USA Bird Avoidance Model). Through them the historical data accumulated in the database recording bird activities and bird strikes can be combined with real-time information and risk components, and apply quick and effective reduction measures.

AIA's Bird Strike Risk Assessment methodology is based on the combination of traditional bird monitoring and bird strike statistical methods, with a GIS interface. The scope of the project, outlined in this paper is to develop a tool that can provide:

- Decision–making support to the Risk Assessment process.
- A monitoring tool to follow the effectiveness and results of the Risk Management procedures.

2. Methodology

The methodological approach for the performance of a Risk Assessment varies according to the subject. It can be complicated or simple. It may include many steps or only a few. However, further to the steps that have to be followed and the outcome of each of them the visualisation of the results is sometimes very important, as hidden patterns or trends may be revealed according to the perspective the statistics are viewed.

2.1 Risk Assessment terminology and methodology

During the previous meetings of the International Bird Strike Committee a significant number of papers provided in detail the terminology and methodological approaches towards bird strike risk assessments, while a number of Internet sites includes similar information.

2.2 Avifauna Monitoring and Bird Control Studies prior to airport opening

As presented during the 25^{th} Meeting of the IBSC, prior to airport opening studies were performed on the avifauna of airport's vicinity in co-operation with the Zoological Museum of the University of Athens. Based on the results of this study a primary risk assessment was performed by specialists from the Frankfurt Main airport and the German Bird Strike Committee. The last group provided the first feedback of the bird strike hazards and proposed not only measures to reduce them but also proposals for monitoring bird activities and obtaining valuable information after airport opening.

2.3 Definition of Parameters required to be recorded

Bird Attributes like the bird species and their characteristics (e.g. weight, size, etc.), their activities (staging, feeding, roosting, nesting, flying), movements, and population numbers are the most basic parameters required for risk assessment.

Attractants like food, shelter or even socialisation give the reasons for the presence of the birds in the vicinity of the area.

This information can be combined with **Surface Analysis** since vegetation cover, surface structure or installations, as well as the conditions of the ground (dry, wet, muddy) and the presence of water (stagnant or flowing) can explain the presence or absence of some species in an area.

Weather conditions (wind direction and speed, precipitation, cloud cover and height) have proved also to be significant parameters that affect bird behaviour.

The **Airport Area** where the presence or the activities of birds are recorded also contributes to risk assessment. Their presence on or near "sensitive areas," like taxiways and runways, usually poses higher risks, while their activities recorded on non-operational areas (e.g., future development zones) may not pose direct hazards. Nevertheless, in the second case, the distance from the "sensitive areas" is an important parameter when response time has to be assessed once the birds decide to move towards these areas.

Finally the **Airport Use** (e.g. runway use, number of movements, aircraft types) plays also its role.

All this information is schematically presented in Figure 1.

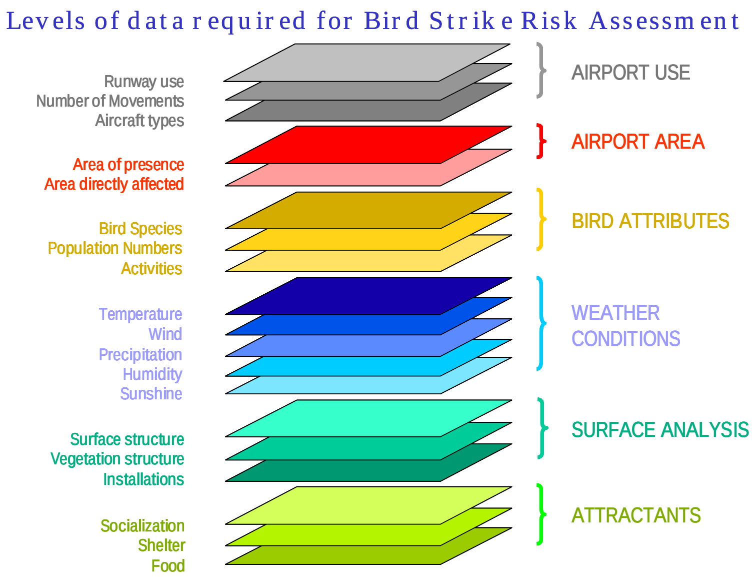

Figure 1*.* *Parameters contributing to a Bird Strike Risk Assessment*

2.4 Potentially dangerous species

In order to obtain a classification of the various bird species and define which of those recorded in the area can be potentially hazardous, an **Aviation Safety Ranking Value (ASRV)** classifying the birds in five levels has also been used, based on the Flight Safety Relevance of bird species proposed by the specialists of the German Bird Strike Committee.
The lowest level, "1" represents the species which pose no danger to aviation, while the highest level, "5" represents bird species that may pose very high danger for aviation.

2.5 Data collection – storage

Data collection has been based on two sources:

1. The observations of the Airside Monitoring and Inspection team (AMI) that performs routine and non-routine inspections on the airfields concerning the status of the runways and taxiways (bird control also included).

2. The recordings of the Supervisor Wildlife and Landscaping (SWL) during a Point Count Tour performed on weekly basis since the airport opening.

2.5.1 The Bird Control Protocol

For the Bird Control part of their tasks AMI staff members have been supplied by a form, the Bird Control Protocol (BCP), where they can record not only bird species and the place, the type and the time of their activities, but also weather and ground conditions, the runway use and bird disperse measures that may be applied together with their duration and effectiveness (see Appendix).

In the BCP all the required information related to a Bird Strike can also be recorded, and forwarded to the SWL, together with bird remains, for further identification of the remains, justification of the conditions under which the strike occurred and issuing of the respective Bird Strike Reports that are forwarded to the Hellenic Civil Aviation Authority (HCAA).

2.5.2 Bird Strike Records

Only data related to Indicated Birds Strikes have been used for this paper. These data have been recorded with the aid of the BCPs, and refer to bird carcasses that have been collected from the airside either during routine inspections or after pilot's report (PIREP) to ATC. The carcasses have been examined to identify whether the death was attributed to a collision to an aircraft or other reasons (e.g. jet blast, lost of stability due to near miss etc). In cases of PIREPS the operators have been interviewed and the aircraft has been inspected for signs of bird collision in order to certify the bird strike.

2.5.3 Point Count Tour

Based on the Point Count methodology for monitoring avifauna, the airport has been divided in 43 sectors (MAP 1 Appendix), separated by physical boundaries (RWYs, TWYs and links, buildings, roads, etc.). All these sectors are visited on a weekly basis (currently every Wednesday) and a 5 min observation of birds and their activities is performed on each of them. The tour is performed during the same time period of the day (from 09:00 to 17:00), while the sector that is visited last during one week is visited first during the next week. The data are recorded in the weekly log (Sky-log).

2.5.4 Bird Mass Density

The estimation of the hazard levels concerning each sector of the avifauna monitoring activities is based on the species and population numbers of the birds recorded, which are interpreted in Mean Bird Mass Density (MBMD) for each sector. MBMD is expressed in g/m^2.

For this interpretation we accept the "worst case scenario" by using the maximum weight of each species according to the measures that followed the examination of the bird carcasses collected on the airport site. If such data are not available for some species the bibliographical data are used instead.
The classification of the MBMD values is based on the classification of the USA Bird Avoidance Model (USA-BAT) published in the Internet, following the respective conversion of the measure units. Three main MBD classes have been used; LOW: 0-0.050 g/m^2, MODERATE: 0.051-2.910 g/m^2 and HIGH: >2.910 g/m^2.
Since the results demonstrated in this paper belong to an ongoing study, there is still no full decision whether the USA-BAT classification can be used on a lower scale and consequently if it is entirely applicable on the case of AIA, or any modification must be applied. Nevertheless, even the use of this

classification can provide significant results concerning the fluctuation of the MBMD per sector on weekly level.

2.5.5 The BIO-Monitoring Information System (BIOMIS) database

Both data sets recoded either in the BCPs or in the Sky-log are transferred in the BIOMIS database. This database has been designed to store all information related to the components of the ecosystems in the vicinity of the airport for conservation purposes. However, it has been proved that with a small only modification of some entities in order to include almost all the parameters stated above (2.3), it could also serve bird hazard control and risk assessment purposes. BIOMIS can generate various types of reports, estimate bird mass density for each point count sector and also perform various statistical analyses.

2.6 Data visualisation

The statistical analyses of the bird control and bird strike data are usually displayed by the use of various charts. However, these charts usually use 2 or 3 dimensions (X-Y-Z- or X-Y1-Y2). In addition qualitative data like surface analyses and vegetation cover cannot be projected in charts. The assessment of the data in a multi-dimensional environment or through an interface that can visualise both quantitative and qualitative data, using overlaying levels can be achieved better using a Geographical Information System.

Geographical Information Systems (GIS)

The most important advantage of a GIS is that a background of the terrain of the airport visualising the surface parameters can be produced and project on it any kind of qualitative or quantitative data using overlapping layers.

Layers projecting the periodical values (e.g. per week, fortnight, or month) of MBMD per point count sector can visualise increased density in various parts of the airport and provide immediate view of the operational areas they will effect. Such a view can reveal risk “trends” which cannot be seen through traditional statistical procedures (e.g. charts).

In the same way real time bird activities can be easily correlated to the area they will affect while having in background data from previous observations. This way fast decision-making approach for risk management can be supported.

The GIS interface currently in use is the ESRI ArcGIS-ArcView.

3. Results and discussion

According to the recommendations of the experts who performed the bird control study prior to airport operation, a 2-3 year systematic recording is required before valuable baseline information about avifauna on the airport and its vicinity can be obtained. This is true for the operational areas where the implementation of the landscaping plan includes systematic and extensive planting according to a certain detailed design. However, there are also extended areas of not treated land, where natural vegetation will be developed. According to the ecosystem dynamics recorded in the Mediterranean ecosystems stability will be reached after 4-5 years.
Given that the development of vegetation cover plays a significant role in avifauna attributes, it is expected that between the vicinity and the airport site, stability of bird attributes will be reached within a period of 5 years from the commencement of airport operation.

Systematic recording of bird attributes started from the first day the airport commenced operation, through both ways described above (see 2.5 Data collection – storage).

Nevertheless, the data discussed here-below concern the year 2002 since the commencement of operation occurred in the end of March 2001 and therefore the annual data for 2001 falls three months shorter. In addition it is during 2002 that the landscaping of the airport reached the optimum performance in terms of ground cover and vegetation development, at least at the operational areas. Therefore, without neglecting the data collected during the 9 months of 2001, it is year 2002 that is considered as the beginning of the five-year period for establishing a baseline, and consequently only these data have been included in this paper.

In addition only a part of the parameters specified above has been used, as the utilisation of all of them would be lengthy.

Bird Control Data

The potentially hazardous for aviation bird species that visited the airport during 2002 are listed in Table I. Their time distribution during the year and the maximum number of individuals recorded is also indicated.

Table I. *Time distribution of bird species potentially hazardous for aviation recorded during 2002 and the maximum population numbers recorded*

Bird Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Max. Pop. Number
Gulls (5)*	■	■	■	■	■	■	■					■	500
Buzzards (5)	■	■	■	■	■	■	■	■	■	■	■	■	6-8
Kestrels (4)	■	■	■	■	■	■	■	■	■	■	■	■	20-25
Magpies (3)	■	■	■	■	■	■	■	■	■	■	■	■	20-30
Starlings (5)	■	■									■	■	10000
Geese (5)	■	■											250-300
Mallards (4)	■	■											250-300
Lapwings (3)	■	■											30-40
Storks (5)								■					250
Herons (4)										■			2

* **Numbers in parentheses indicate the Aviation Safety Ranking Value which** separates birds in 5 groups according to the hazard that will be potentially posed to aviation: (1) without significant relevance for aviation safety, (2) low potential danger, (3) intermediate potential danger, (4) high potential danger, (5) very high potential danger.

According to the data collected from the BCPs the highest number of bird disperse actions was performed during Jan-Feb, May-Jun and Nov-Dec 2002 (Diagram 1), actually removing the highest numbers of birds in terms of bird mass (Diagram 2). The data demonstrated in Diagrams 1 & 2 correspond to the data included in Table I. Yet for their better interpretation the following details must be mentioned:

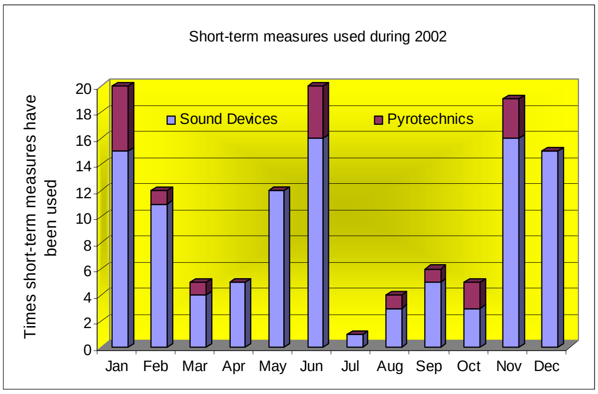

***Diagram 1**: The monthly use of the short-term measures during 2002*

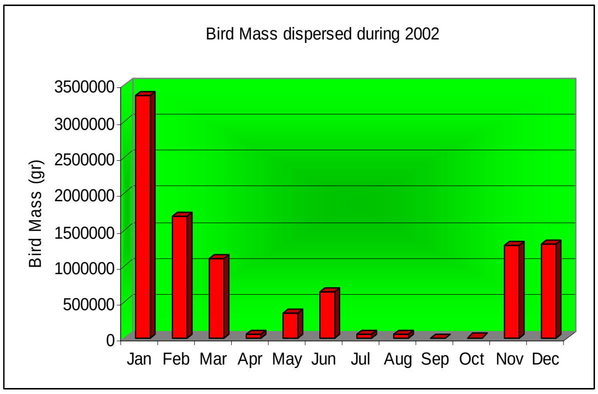

***Diagram 2**: Monthly distribution of mass of birds dispersed from airport site during 2002*

- During the two first months of the year the majority of the birds contributed to bird strike risk were waterfowl, with a significant contribution from starlings and a minor one of gulls.
- In spring and the beginning of summer gulls mainly contributed to bird strike risk with a minor contribution from birds of prey.
- From mid-summer to mid-autumn it was raptors that posed the highest hazards for bird strikes, except to a very short presence of storks (they spend on the airport only one night to rest during their migration journey, without causing any significant problem to airport operation) and herons.
- During the two last months of the year the contribution of starlings to the bird strike risk was the most significant with a minor contribution from gulls and raptors.

Bird Strike Data

The analysis of the results regarding the Indicated Bird Strikes is illustrated in Diagrams 3 & 4. The numbers of strikes were increased in June, September and October. The majority of the individuals collected from the airside were birds of prey (54%), mainly Kestrels. Seagulls had a lower contribution (27), while waterfowl a very small (1%). The contribution of the small birds (18% – mainly sparrows, larks and swallows) is noticeable. The later actually belong to Level 1 (without significant relevance for aviation safety) of the ASRV classification mentioned above. The majority of the strikes recorded during June involved gulls, while the majority of the strikes recorded during September and October involved birds of prey.

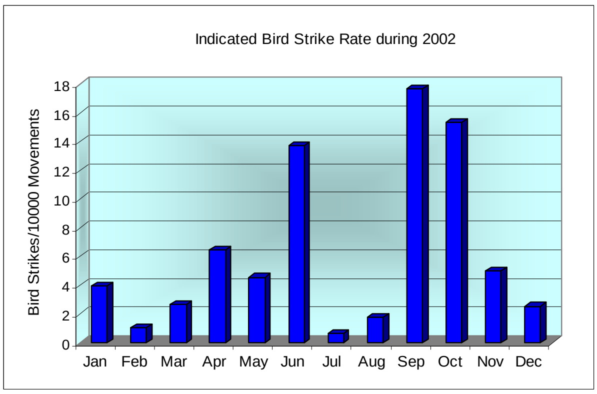

***Diagram 3**: Monthly distribution of Indicated Bird Strikes during 2002*

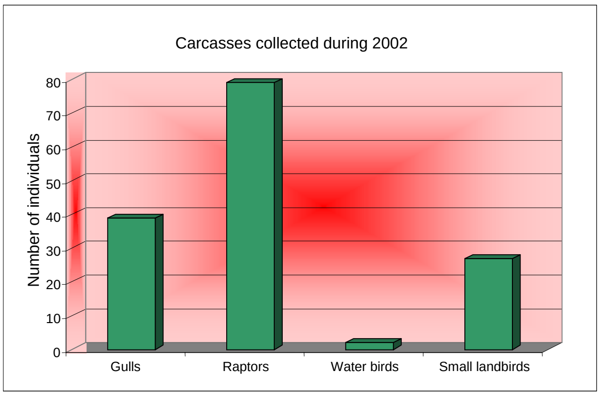

***Diagram 4**: Species contribution in the bird remains collected during 2002*

Although all the bird strike incidents recorded during 2002 had no significant impacts on the flights (for the majority of them there was not even a PIREP to ATC) by applying this data to the risk tolerability matrices proposed by ALLAN (2000) and ROCHARD (2000) the level of harm falls within the "Minor" class while the probability of occurrence in the "Frequent" class, therefore a "Review" of the Risk Assessment and Management procedures is required.

The conclusion whether it is the Risk Assessment procedures that failed to properly estimate the risk or it was the Risk Management measures that were not effective can only be reached after answering the following questions:

1. In June short-term measures have been used many times against gulls, but the numbers of strike are increased. Is it because of the low effectiveness of the measures applied or other reasons contributed to this?

2. During September and November the times the short-terms measures applied for Bird Control are few. Is this the reason for the increased number of strikes?

3. Since a continuous programme for monitoring bird activities on the airport site has been established, why did this programme fail to realise the increased collision hazards and perform the appropriate risk assessment?

Surveys had been conducted immediately after realising the increased number of bird strikes in order to revise the risk assessment and management measures. In all surveys weather conditions proved to play an important role in the understanding of the problem.

The precipitation was high all through the year 2002. Although, the climate of E. Attiki is dry, 2002 has been very "wet". The year started with the highest snowfall of the last 100 years, and low temperatures and high precipitation was recorded till mid-spring. Rainfalls were prolonged till mid-summer, and after a small break in July and August started again in September and October. Further to the other consequences listed below the most important result of these climatic conditions is that any comparison to the data collected during 2001 (a very "dry" year in terms of precipitation) was impossible. This result stressed the importance of historical data in the process of risk assessment.

In relation to the questions applied above the following have been recorded:

1. The low temperature recorded in spring delayed the agricultural works (mainly ploughing) around the airport, while the prolongation of the rainy period lead to a respective prolongation of these works till June. As a result, significant numbers of gulls were gathered in the vicinity outside the airport site. Although the measures applied for making the airport site less attractive to them were significantly effective, as extracted from the BCPs, the random crossings of gulls over the airport site increased the possibility of a strike. As soon as this situation was realised security patrols in the boundaries of the airport have been asked to report agricultural activities in the vicinity of the airport, while ATC started issuing warnings to the pilots about the bird activities around the airport, as it was not possible to control agricultural works outside the airport site.

   Under these circumstances the increased number of bird strikes during June is considered a failure of the Risk Assessment procedures to identify the proper risk level due to lack of background information.

2. The warm and wet conditions during the summer resulted to the development of a high number of caterpillars, insects and snails, which reached a peak during September and October and attracted a high number of raptors on the airport site. Although insecticides and snail repellents have been applied as a long-term measure, the frequent rainfalls were washing the chemical agents, reducing the effectiveness of this measure. The only effective measure applied was runway and taxiway sweeping to remove bird attractants (caterpillars and snails). In addition the short-term measures (active disperse) proved to be also ineffective and therefore they were applied only in a few cases.

The failure to apply effective long- and short-term measures in order to reduce bird attractants is obvious, however, the questions still remains whether the hazards posed by presence and activities of birds were properly set in the Risk Assessment survey.

The latter is related to the third question submitted above, and the answer lies in the use of the tool that is being used for the visualisation of the data of the wildlife monitoring programmes and which also contributes to the risk assessment: the GIS interface.

Analysis of the Avifauna Monitoring Data

Since the beginning of the operation of the airport is was made clear that the quick analysis of the data collected during the various procedures established for monitoring bird activities would certainly contribute to the application of more effective measures towards the reduction of bird collision hazard. The GIS software was already in use in connection to environmental issues; therefore it was considered useful to use the cartographic utilities of it in order to visualise the presence of bird on the airport map. The first efforts were very successful and they contributed to the development of long-term measures in order to reduce bird activities on airport site.

The USA-BAM provided also the idea to design a similar function for AIA and test it against risk assessment following various approaches.

Step 1
The first approach towards the risk assessment using the data collected during avifauna monitoring surveys is the visualisation of the MBMD in GIS. The inclusion of the data of the whole 2002 would make this paper very long. Therefore, only the data of September have been used here, since one of our main questions included is the understanding of the data of this month. In MAPs 2 and 3 in the Appendix the airport use during September and the MBMD per sector for each of the four weeks of the same month are illustrated.

As seen in MAP 3 the MBMD did not exceed the “MODERATE LEVEL” during September 2002. However, the registration of moderate MBMD in sectors very close to “sensitive” (operational) areas was a first indication of increased bird collision risk. It is also noticeable that there are sectors that show moderate MBMD for two or more successive weeks. The latter would probably be a first indication of the existence of an attractant in these sectors.

Based on this data a quick survey was conducted that proved the absence of important attractants in these sectors. A review of the lists of the species observed in the sectors where moderate level of MBMD was recorded showed that in their majority they were small passerines and swallows. They were considered as not posing dangers for aviation despite their increased numbers.

Nevertheless, an increased number of indicated bird strikes was a fact.

The visualisation of these strikes according the areas where the carcasses were collected is shown in MAP 4 in the Appendix. It is obvious that the pattern of these strikes cannot be explained by the MBMD patterns. Such a result was actually expected since the MBDM patterns are not a forecast whether a bird strike would occur or not, but more or less they are indicating risk levels. Therefore, it became apparent that either our risk assessment approach should include more parameters or we should follow some other approach.

Step 2
After the failure to reach a more accurate estimation of the bird strike risks by using the MBMD we proceeded with the utilisation of more parameters from our database. The next step of the analysis of the collected data was to define within each sector the contribution of each of the five ASRV classes (MAP 5 in the Appendix) in the overall bird mass, in order to clarify whether the MBMD recorded was a result of species posing high hazards or not. The results of this analysis made clear that for the majority of the sectors that “moderate levels” of MBMD was recorded this was the contribution of high numbers of birds classified in ASRV classes 1 & 2.
At the same time the contribution of bird species of the ASRV classes 3 to 5 at some sectors were the MBMD recorded was at the “LOW LEVEL” was revealed.

The comparison of the data illustrated in MAPs 4 and 5 shows that in most of the cases the indicated bird strike patterns match the patterns related to the recordings of birds classified in ASRV classes 3 to 5 in the nearby sectors. This result made it obvious that further to the approach that includes the evaluation of the MBMD for each sector the analysis of the ASRV classes in it is required.

Step 3
Going one more step further we also analysed the presence of the birds that are classified in the ASRV classes 3 to 5 in each sector and especially the falcons. The results are illustrated in MAP 6. The comparison of the data included in MAPs 4, 5 and 6 revealed a relatively high level of compatibility, even in cases that airport operation parameters were showing some variation (e.g. runway use).

Conclusions

The use of the classical statistical tools (e.g. charts, tables, matrices, etc.) will always play a significant role in the analysis of historical data related to bird control and bird strikes. Historical data are necessary in order to proceed to an effective approach of assessing bird strikes risks in an airport as they help bird controllers to assess risk by similarities. However, there are many cases that new parameters or changes to those existing must be considered and an approach by similarity cannot provide effective risk analysis, not to mention the case of new airports that no such historical data exist.

A well established avifauna monitoring programme combined with the respective reporting system during the first years of the operation of a new airport can provide not only baseline (historical) data but also valuable information for an effective approach of the bird strike risk assessment in real time.

The GIS interfaces have a significant contribution towards this effective approach, as they are able to combine in various layers the utilisation of a great variety of parameters, varying from bird activities to airport’s environment and operation, including and project background data together with real time one. In addition providing that a good and fast interface between the databases and the GIS is established, it is obvious that the results of the risk management measures can be evaluated and re-enter to the system in a short time, thus a prompt re-assessment of the risk analysis approach can be obtained.

The MBMD on various areas of an airport, the contribution of the ASRV classes in it together with the visualisation of the population numbers of those species that are classified in the ASRV classes 3 to 5, are parameters that can lead to an effective risk assessment.

4. Follow-up

As already mentioned above this paper is only a first presentation of an ongoing project. For this reason we have analysed in details only a few parameters of those that can contribute to an effective risk assessment approach by the combination of bird control/strike data with a GIS interfaces.

For many parameters mentioned in the beginning of this paper (e.g. weather conditions) but not illustrated in details the collection of historical data will play a significant role. Re-evaluation of other parameters should also be considered (e.g. the MBMD classification or the inclusion of the bird species in the certain ASRV classes) after collecting a significant amount of background data.

Acknowledgements

Special thanks must be given to the Airfield Services Department of the Athens International Airport and especially to Airside Monitoring and Inspection team, who actively support every day the Bird Hazard Control and Reduction Programme not only by providing all the information required (through the Bird Control Protocols) but also by developing their own fruitful initiatives.

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APPENDIX

Issue 1	Athens International Airport s.a. – Form	Page 1 of 2
July 2002	**BIRD CONTROL PROTOCOL – FRONT PAGE***	**F2 7.11 BCP**

EVENT DATA

Date: (YYYY/MM/DD)	2 0 __/__/__	Starting Time: (hh:mm 24 hours format)	__:__ (Local)	Ending Time: (hh:mm 24 hours format)	__:__ (Local)

Person(s) Responsible: .... Office Number: .... Tel. Number: ....

Car Registration No: .... Signature: ....

RWYs in use:

- 03R ☐ *Take-off* ☐ *Landing* ☐
- 03L ☐ *Take off* ☐ *Landing* ☐
- 21R ☐ *Take-off* ☐ *Landing* ☐
- 21L ☐ *Take-off* ☐ *Landing* ☐

Event Remarks (please provide details here):

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WEATHER CONDITIONS

Wind:	Relative speed: *Calm to weak* ☐ *Moderate* ☐ *Strong* ☐ *Very strong* ☐		Direction:	
Sunshine:	Clear ☐ Light haze ☐	Haze ☐ Fog ☐	____% cloud cover Full overcast ☐	
Rain:	No rain, Intermittent showers, Rain (steady), Storm (heavy rain)	Now ☐☐☐☐	Past 24 hours ☐☐☐☐	Last 7 days ☐

GROUND CONDITIONS

Ground Humidity:	Dry ground ☐ Wet ground ☐ Muddy ground ☐ Still water ☐ Flowing water ☐	Waste:	Clean ☐ Debris ☐ Residual ☐ Organic ☐ Hazardous ☐	Agricultural treatments:	Mowing ☐ Seedling ☐ Planting ☐ Pruning ☐ Fertilizing ☐ Pesticides ☐ Insecticides ☐
Comments:					

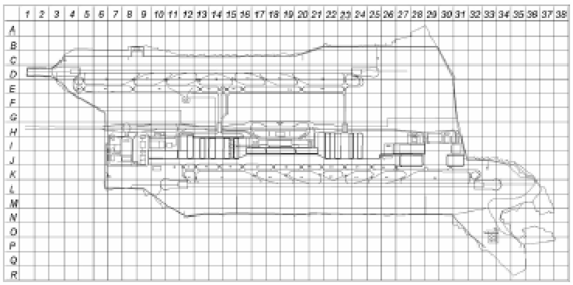
SITE DATA**

Area Name:			
ALTITUDE:	Min: m AGL	Max: m AGL	
EGSA '87 GRID:	X_0:	Y_0:	Size: m

*Please fill a separate form for each airfield or other area of the airport.
**Gray area to be filled by the Supervisor Wildlife & Landscaping

FORM F2 7.11 BCP Bird Control Protocol

Issue 1	Athens International Airport s.a. – Form	Page 2 of 2
July 2002	**BIRD CONTROL PROTOCOL – BACK PAGE**	**F2 7.11 BCP**



Use this map to indicate, the areas where birds have been observed, using a circle or arrow and the respective species number (see below)

BIRD SPECIES RECORDED AND NUMBERS OF INDIVIDUALS

Species	Grid, Numbers & Activities*	Species	Grid, Numbers & Activities*	Species	Grid, Numbers & Activities*
1. Buzzards		6. Crows		11. Swallows	
2. Falcons		7. Pigeons		12. Water Birds	
3. Gulls		8. Starlings		13. Land Birds	
4. Magpies		9. Owls			
5. Ducks		10. Herons			

***Use the following symbols to indicate activities: ST:** staging, **FE:** feeding, **RO:** roosting, **NE:** nesting, **FL:** flying, **CA:** dead (carcasses should be forwarded to WA)

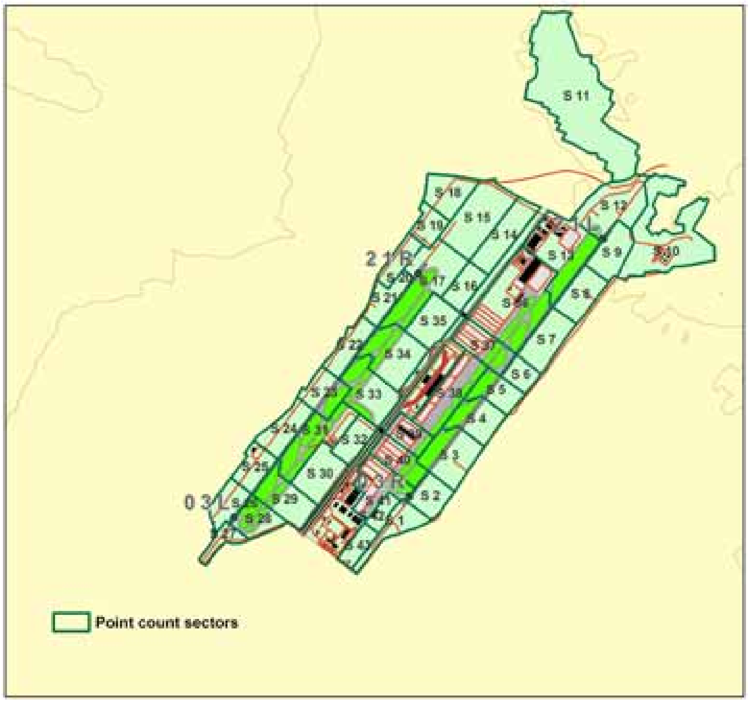
MEASURES AND RESULTS

Measure	Duration or Number	Result	%	Measure	Duration or Number	Result	%
☐ **Bio-acoustics**		☐ yes ☐ no		☐ **Shotgun Blanks**		☐ yes ☐ no	
☐ **Play-back sound**		☐ yes ☐ no		☐ **CAPA**		☐ yes ☐ no	
☐ **Whistle**		☐ yes ☐ no		☐ **Live Ammunition**		☐ yes ☐ no	
☐ **Bird Bangers**		☐ yes ☐ no		☐ **Other**		☐ yes ☐ no	
☐ **Siren Screamers**		☐ yes ☐ no		☐ **None**			

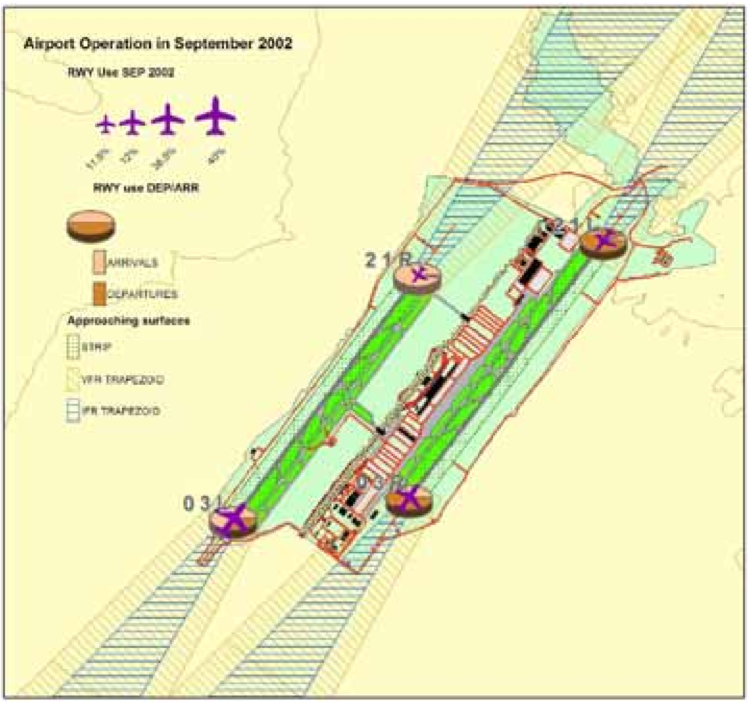
FURTHER ACTIONS*

*Gray areas to be filled by the Supervisor Wildlife & Landscaping

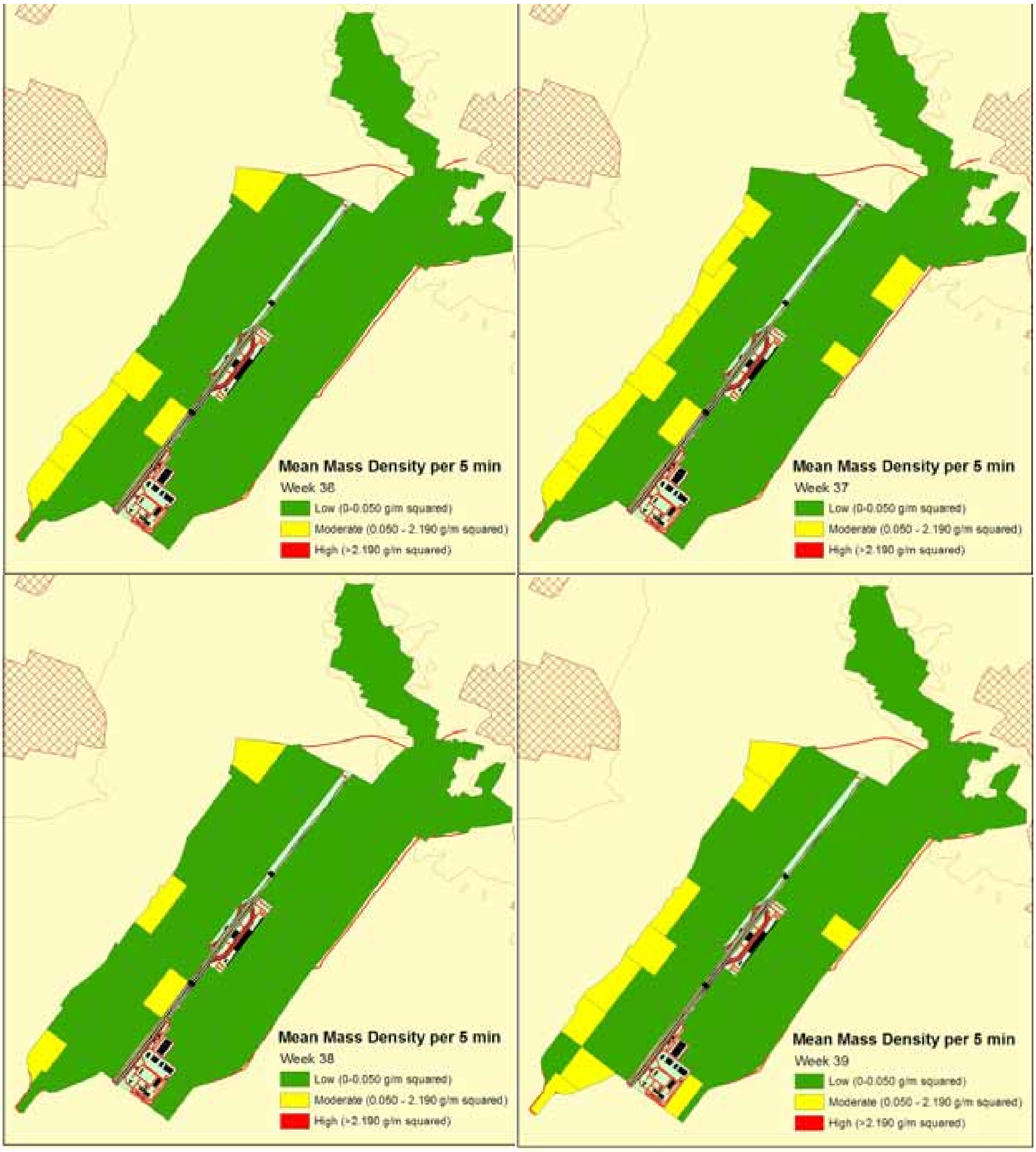
MAP 1. *Point Count Sectors of AIA*



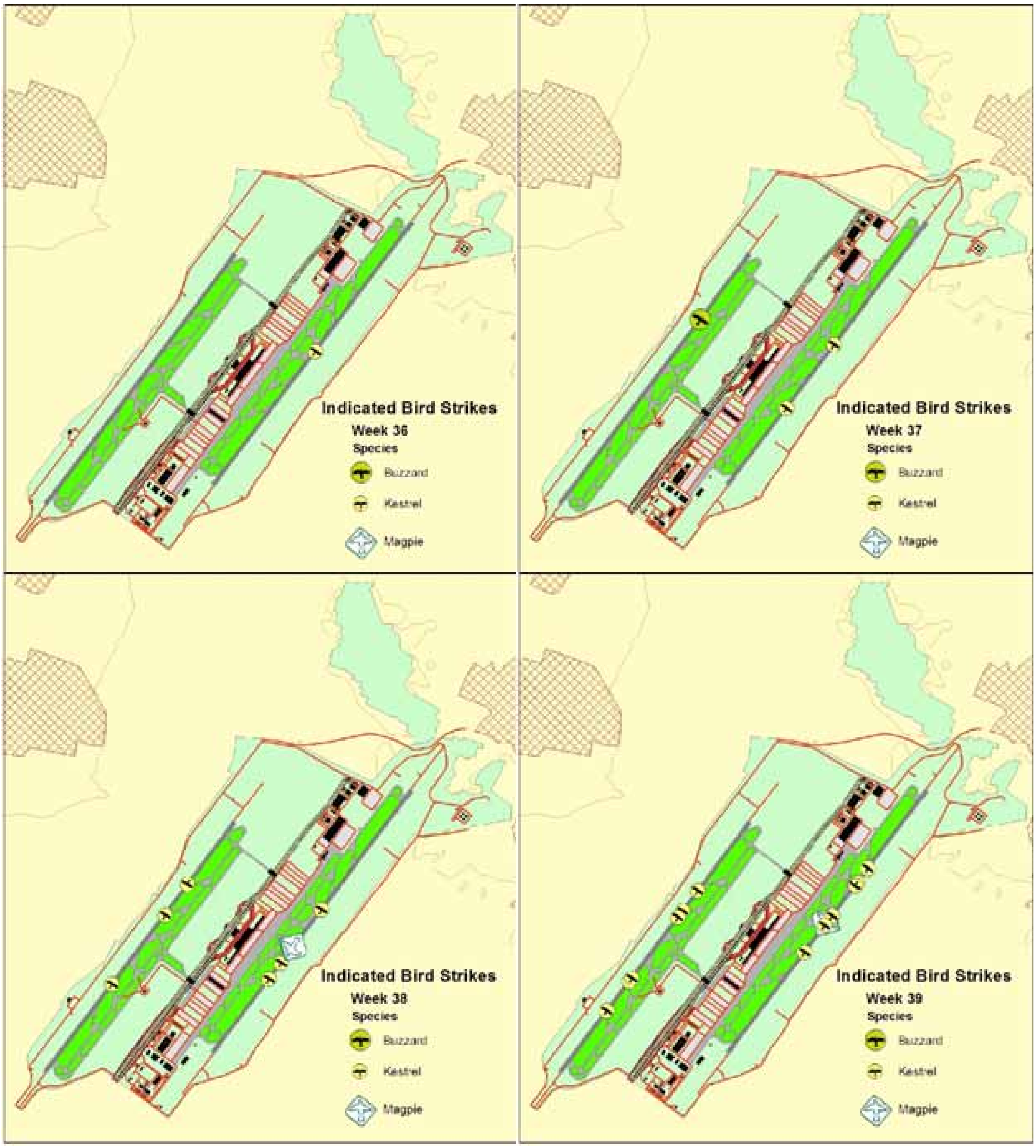
MAP 2. *"Sensitive areas" of AIA and airport operation during September 2002*



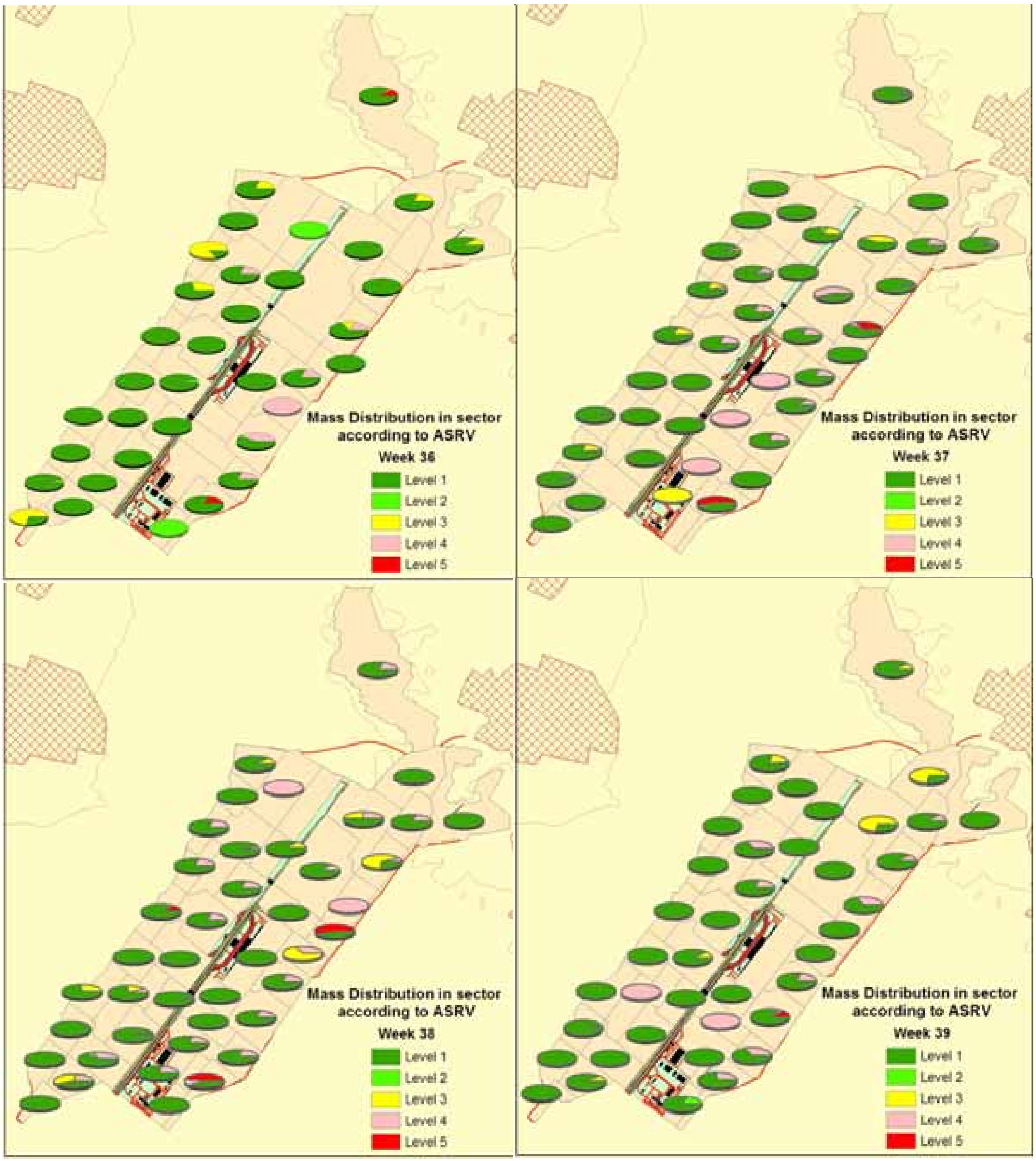
MAP 3. *MBMD during the four weeks of September 2002*



MAP 4. *Weekly distribution of Indicated Bird Strikes during September 2002. The orientation of the markings (NE-wards or SW-wards) indicates the use of the RWYs; 03 or 21 respectively*



MAP 5. *Mass distribution in each sector according the ASRV classification for September 2002. Sectors without chart correspond to absence of bird activities*



MAP 6. *Mean distribution of Falcons per sector during September 2002 compared with the respective indicated bird strikes*