BSCE 18/ WP 8 REVISED
Copenhagen May 1986

U.S. AIR FORCE BIRD STRIKES 1983-1985

Michael M. Thompson
Russell P. DeFusco
Timothy J. Will

HQ Air Force Engineering and Services Center
Tyndall AFB, Florida 32403

Abstract

The United States Air Force Bird-Aircraft Strike Hazard (BASH) Team has maintained birdstrike records for the USAF since 1975. Although some data is available from as early as the 1960's, inconsistent reporting procedures and incomplete information limits its use. Not until 1982 have awareness programs and mandatory reporting procedures resulted in consistent birdstrike reporting throughout the Air Force. Finally, we are getting a more accurate picture of the overall impact birds are having on our aircraft. This paper presents 1984 and 1985 USAF birdstrike data and analyzes and compares data from 1983 (BSCE 17), 1984 and 1985.

INTRODUCTION

The Bird-Aircraft Strike Hazard (BASH) Team has maintained United States Air Force bird strike data since 1975. Although some data is available from as early as the 1960's, much of it is sketchy due to inconsistent reporting procedures and incomplete information. These early data are useful for supporting research and development efforts, but are not complete enough to establish trend information for directing BASH reduction efforts. Mandatory reporting procedures and improved BASH awareness programs have resulted in consistent bird strike reporting since 1982 throughout the Air Force.

The BASH Team has directed an intense awareness program to emphasize the importance of bird strike reporting. The 1985 program included a pilot-oriented BASH film, "Dangerous Encounter," an Air Force-wide workshop for BASH reduction program managers, and numerous safety journal publications. The current bird strike awareness program stresses pilot response, pilot identification of hazards, a model BASH Plan, BASH reduction methods from trend information, and research and development of bird resistant aircraft parts.

Mandatory bird strike reporting reinforced with a strong awareness program is providing us a good strike data base and giving us a more accurate picture of the overall impact birds are having on our aircraft.

In 1984 the Air Force reported over 2300 strikes, which was consistent with the 1983 report (BSCE 17). Increased emphasis on strike reporting elevated the 1985 strike report to 2700. Although increased awareness has increased reported strikes, BASH reduction efforts have realized a dramatic decrease in strikes at individual bases. Unfortunately, at this time, critical information is not available in order to perform proper statistical analysis for all reported Air Force bird strikes. Air Force bird strike trends and a summary of the data gathered are given below.

AIRCRAFT INVOLVED IN BIRD STRIKES

Aircraft mission plays a major role in which planes take the most bird strikes. Aircraft which fly high speed, low-level will be much more susceptible than those which spend more time aloft. Additionally, aircraft size, configuration, type of engine and geographic location play a role in aircraft susceptibility to strikes.

Figure 1 shows that fighter aircraft led the list in most bird strikes. This fact is not surprising but can be misleading. The number of aircraft involved, hours flown and emphasis on low-level flying make our fighters most susceptible to bird strikes, yet other aircraft such as the B-52 actually have higher strike rates per flying hour. Overall, the Air Force averages 76.1 strikes per 100,000 flying hours.

IMPACT LOCATIONS

Any part of an aircraft can be, and has been, struck by birds (Figure 2). It appears that the probability of a strike on any portion of an aircraft is directly related to the surface area exposed to the windstream. Because strikes appear to be randomly distributed on aircraft, a few inches in either direction may spell the difference in a glancing blow with no damage and the loss of an engine or canopy penetration. It is of utmost importance that non-damaging strikes be reported along with those which cause damage due to this fact.

Engine strikes top the list of points of impact, partly due to their relative cross sectional area, but also because strikes to this area are generally most damaging and are thus more thoroughly reported.

Reported canopy strikes have increased over the past couple of years. However, penetrations have decreased due to the retrofitting of impact-resistant canopies/windscreens developed in part by the Wright Aeronautical Laboratory, Wright-Patterson AFB, Ohio. We anticipate decreased damages in the future with the development of new composite skin structures and improved engine designs.

BIRD STRIKES BY PHASE OF FLIGHT

Assuming that many of the bird strikes in the "unknown location" category occur on airfields, over 50% of Air Force bird strikes occurred in the airdrome environment (Figure 3). This proportion is due to the fact that a great deal of time is spent in this environment. Also, high aircraft density, low altitude and greater vulnerability to strikes during takeoff and landing contribute to this statistic. Fortunately, it is in this area where we have the most control to reduce bird hazards. Airfield habitat manipulation is critical to bird strike reduction and maximum effort should be taken to make the airfield as unattractive to birds as possible. Additionally, every airfield should have frightening equipment on hand, particularly bioacoustics and pyrotechnics, to disperse flocks of birds as they occur on the field. Operational changes such as raising pattern altitude, changing pattern direction or ground tracks, flying during least hazardous periods, etc., should also be considered.

A large number of bird strikes also occurred on our low-level routes. With the increasing emphasis on high-speed, low-level flying, this is to be expected, but control in this environment is much more difficult to achieve. We can fly at times of the day or season when birds are less prevalent and should avoid known concentration areas of birds. The computerized Bird Avoidance Model (BAM) is helping to make our low-level routes safer by allowing pilots and schedulers to select routes with lesser bird strike risks (Kull 1984).

Figure 4 shows that over 97% of our bird strikes occur below 3000 feet AGL, with the majority occurring in the airdrome and on low-level routes. Since bird strikes increase significantly as altitude decreases, the importance of remaining as high as possible in the pattern and on low-level routes is clear when the mission permits.

TIMES WHEN BIRD STRIKES OCCUR

The Air Force does most of its flying during the day; so naturally, most of our bird strikes occur then. Figure 5 shows that over 70% of our strikes occurred during daylight hours. Birds are most easily seen and avoided during the day and pilots must be aware of measures they can take to reduce bird strikes, such as remaining on the lookout for potential bird hazards, or performing appropriate bird avoidance maneuvers (DeFusco and Turner 1986).

Many birds are most active at dawn and dusk as they fly to and from feeding or roosting areas. Strike numbers are low at this time in large part because little flying is done during these hours. However, a disproportionately large number of strikes occur here per flying hour and extreme caution must be exercised during these times.

Many strikes occur at night during migration periods. Most waterfowl and passerines (perching birds) migrate at night, thus, night flying in spring and fall can be particularly hazardous. October is traditionally our most hazardous month for bird strikes at any time of the day in the U.S. (Figure 6). Different bird movement patterns make mid-summer most hazardous for U.S. Air Force aircraft in Europe.

TYPES OF BIRDS STRUCK

In order to make more meaningful recommendations for bird control, the BASH Team makes every effort to identify the species of birds involved in collisions with aircraft. If local identification is not possible, base safety officers should send feathers to the team for microscopic analysis and positive identification. Increased emphasis on post-strike feather identification has given us a much better idea of which birds to concentrate control efforts on to reduce the hazard. Figure 7 lists the types of birds most commonly involved in collisions with aircraft worldwide. Gulls and raptors (birds of prey) lead the list, with most gulls hit in the airdrome and hawks and vultures on our low-level routes. Gulls can be most effectively controlled by proper habitat management including proper landfill operations, combined with an active frightening program using bioacoustics and pyrotechnics at the airfield. Avoiding raptor strikes is much more difficult and requires operational changes such as flying at times of the day when raptors are not commonly aloft, or avoiding ideal terrain for soaring raptors to utilize. The large number of dove strikes is of concern; most of these strikes were due to improper habitat management at a few bases, such as planting of seed-producing plants near the airfield for agriculture or erosion control.

The importance of positively identifying birds which are involved in collisions with aircraft cannot be overemphasized, because only then can realistic reduction measures be taken. The BASH Team makes recommendations based on species present and conditions at each installation and training area.

CONCLUSIONS

In the past few years, the BASH Team has gained a much better picture of the impact birds are having on our aircraft. Trends such as those presented in this paper allow us to more realistically attack the problem and develop applicable solutions both on a wide-scale and on an individual basis. Collection of complete accurate data allow us to develop these management strategies for future BASH reduction programs wherever we fly. Ultimately, we can make the business of flying a safer one for our aviators.

REFERENCES

DeFusco, R.P. and R.A. Turner. 1986. Dodging Feathered Bullets. TAC Attack 26 (04):26-27.

Kull, R.C. 1984. Bird Avoidance for Military Low-Level Operations in the United States. Proc. Bird Strike Committee Europe Meetings 17:342-349.

FIGURE 1

BIRD STRIKES BY AIRCRAFT TYPE
1983-1985

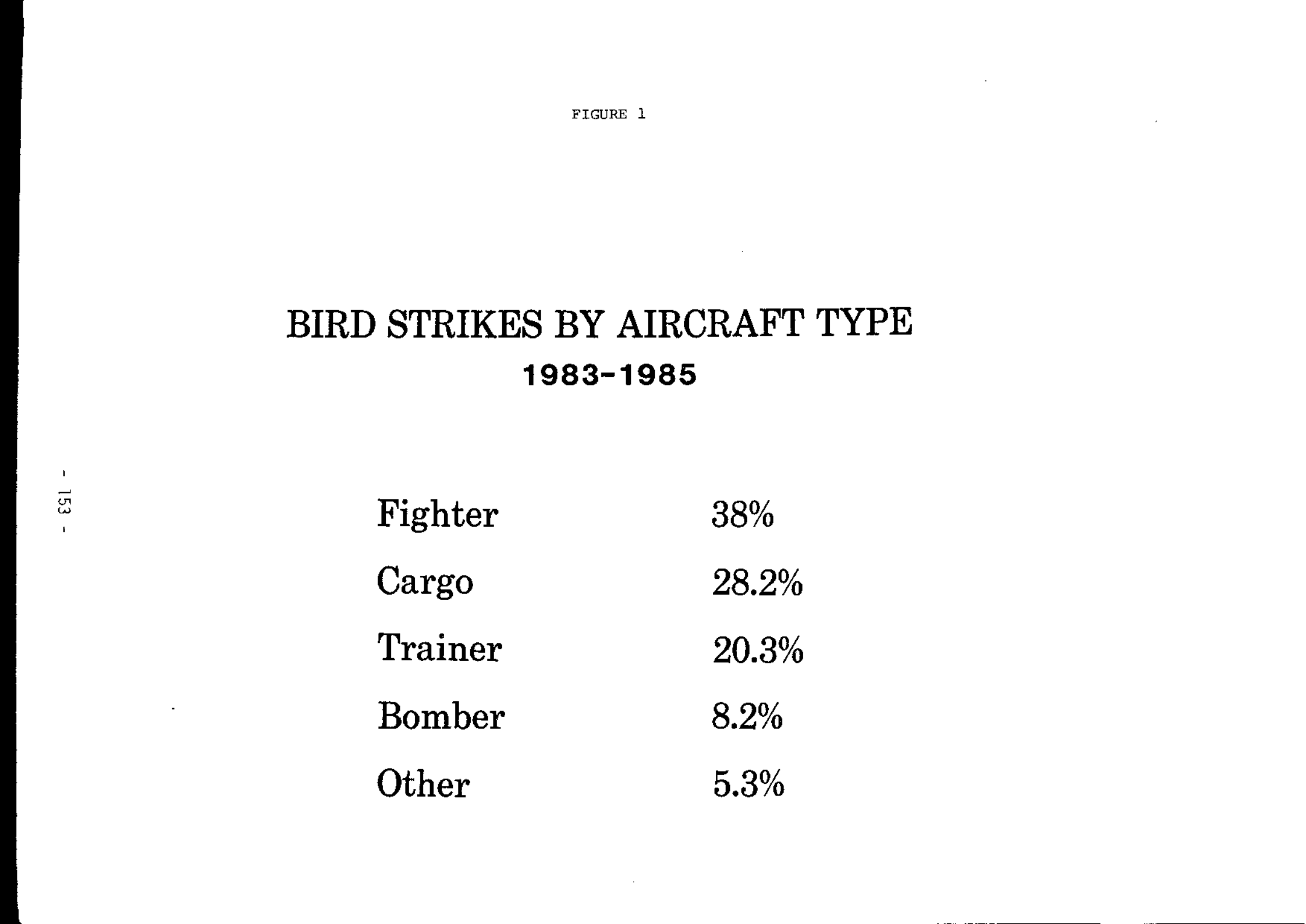

FIGURE 2

BIRD STRIKES BY IMPACT POINT

1983-1985

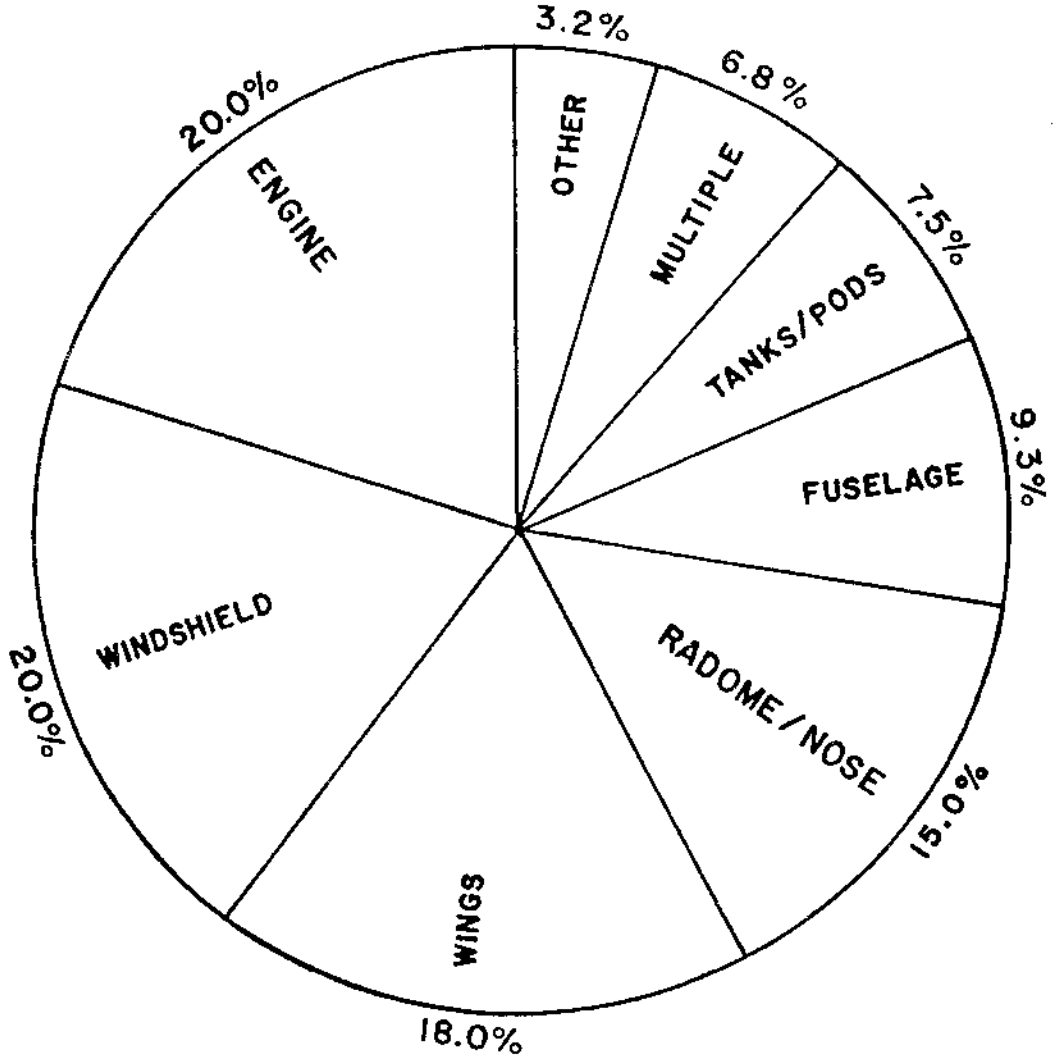

FIGURE 3

BIRD STRIKES BY PHASE OF FLIGHT

1983-1985

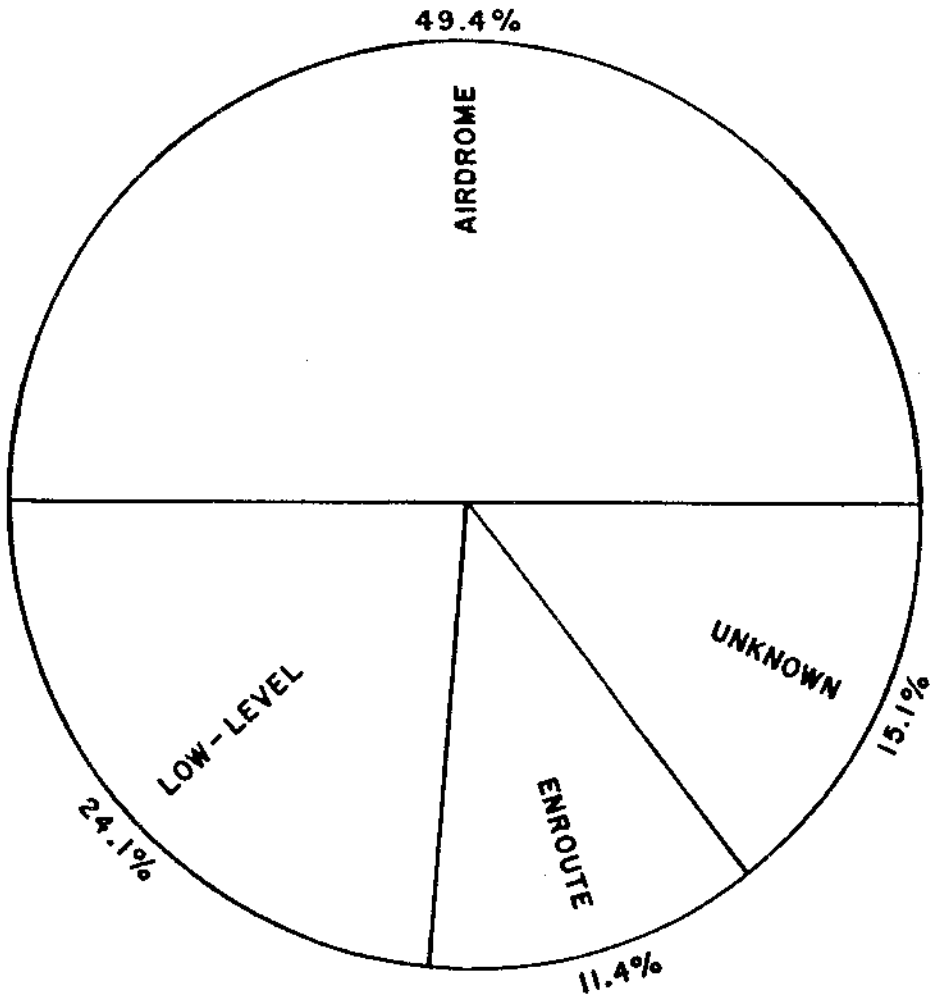

FIGURE 4

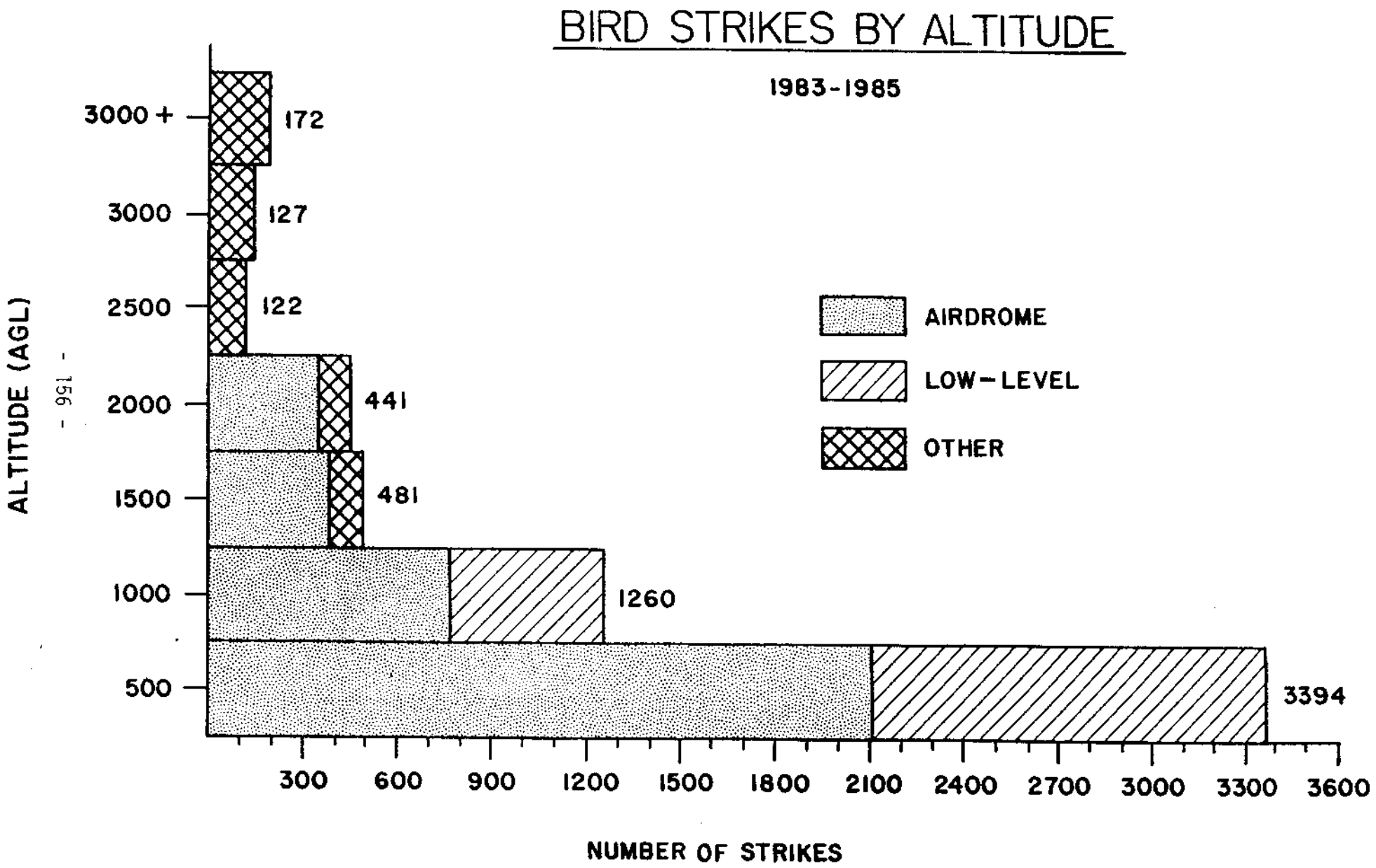
BIRD STRIKES BY ALTITUDE
1983-1985
3000 +
3000
2500
2000
1500
1000
500
172
127
122
441
481
1260
3394
AIRDROME
LOW-LEVEL
OTHER
ALTITUDE (AGL)
300
600
900
1200
1500
1800
2100
2400
2700
3000
3300
3600
NUMBER OF STRIKES

FIGURE 5

BIRD STRIKES BY TIME OF DAY

1983-1985

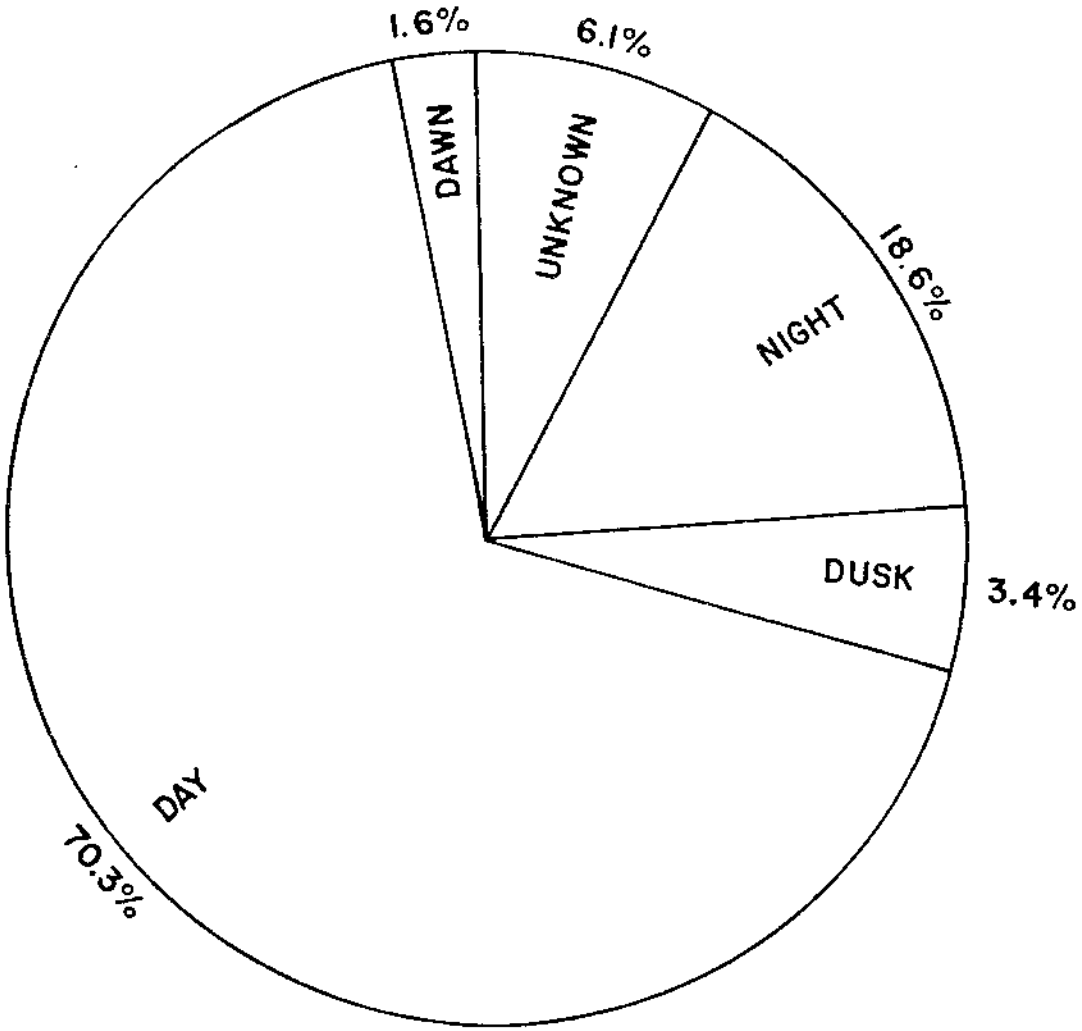

FIGURE 6

BIRD STRIKES BY MONTH

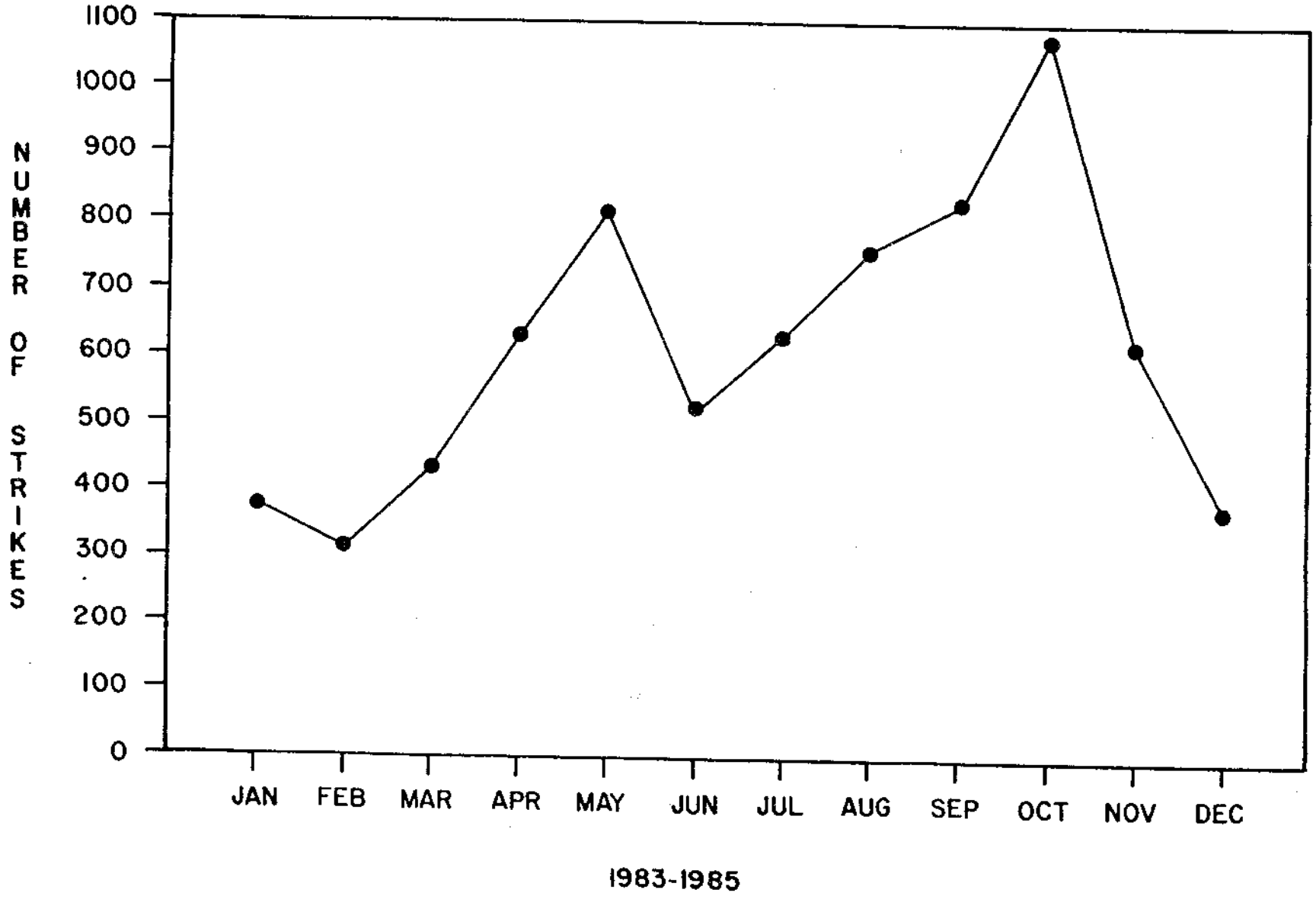

FIGURE 7

BIRD TYPES IDENTIFIED
1983-1985

Gull	364	Horned Lark	82
Hawk	344	Blackbird	79
Vulture	160	Meadowlark	74
Dove	148	Pigeon	56
Duck	126	Egret	44
Starling	82	Shorebird	42