AN ANNOTATED BIBLIOGRAPHY OF BIRD HAZARDS TO AIRCRAFT

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ABSTRACT

A project to produce an annotated bibliography of bird hazards to aircraft, termed ABBHA, is underway in co-operation with the US Air Force Armstrong Laboratory's Technical Information Center. The goal of this project is to stimulate and facilitate additional research into the biological and risk management aspects of bird hazards to aircraft. A companion database on transparency durability research, which relates to birdstrike resistance engineering, is also under development.

The working papers of the Bird Strike Committee Europe (BSCE) bring together much of what is known about the subject and methods to reduce bird-aircraft interactions. Additionally, an enormous amount of information is published in scientific journals, in proceedings of conferences and in technical databases. Currently, the ABBHA brings together 264 BSCE citations pertaining to birdstrike avoidance, birdstrike engineering, bird management and control and bird remains identification. Over 200 citations from other sources also are included in the latest ABBHA version.

The ABBHA is being developed in a magnetic format to simplify searches and to be compatible with a variety of software. Standardised keywords were assigned to the individual citations to facilitate searches. Potential users of ABBHA, the Bird Strike Committees of Canada, Europe and the United States, were included in the development of the database and the selection of keywords.

(Keywords: Bibliographic; Literature survey)

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At Bird Strike Committee Europe (BSCE) 21 (Working Paper 34), I reported on the initial development of an annotated bibliography of bird hazards to aircraft, or ABBHA. At that meeting, it was proposed that the BSCE, as the premier source of information on the bird-aircraft problem, might expand its role to become a repository for information on the subject. Previously, the BSCE had confined itself only with indexing those working papers presented at its meetings. It was agreed to study the proposal in more depth during BSCE 22.

The concept of a database on bird hazards arose from discussions with members of the Standing Committee on Applied Ornithology, a special issues group of the International Ornithological Congress XX. The ABBHA project was conceived to stimulate additional research, both basic and applied, into the hazards posed by birds to aviation. The ABBHA will help facilitate the exchange of information needed to reduce the damage to aircraft caused by birds.

References on bird hazards are numerous and exist in many different sources: proceedings of workshops and conferences, national and military technical databases, vendors and independent contractors. Bird hazard research is somewhat arcane and usually is not widely available to the ornithological community. Pulling together these references into a single, comprehensive bibliography can improve problem characterization and help researchers establish the effectiveness of various techniques within a minimum amount of time. Having readily accessible information from several sources in one place offers new opportunities for learning and can stimulate new insights. Improved access to information can help keep researchers from following "dead ends". ABBHA is an effort to make it easier for researchers to obtain information about bird hazards to aviation, and thereby, enhance the development of solutions. ABBHA can also serve as an aid to the implementation of bird hazard reduction activities.

Criteria Used for ABBHA

The ornithological research community and aerodrome managers are most likely customers of ABBHA. Other customers might include vendors of bird control equipment. The customer needs would include quick, versatile search capability, ease of use, and inexpensive fielding through compatibility with a variety of computer systems and software. By using an electronic medium for distribution, ABBHA is designed to accommodate browsing. Besides being simpler to update, distribution of ABBHA via computer diskette will be inexpensive and will require less paper since the researcher can print out only those citations of interest. This feature will also simplify the institutional management of ABBHA.

Eventually, the ABBHA could be available through the Internet or other electronic bulletin board system.

Constructing ABBHA

The basic process of constructing ABBHA was relatively straigtforward. Over the last two years, bibliographic information on bird hazards to aircraft were extracted and incorporated into an electronic database file. These references were taken from the citations provided by the Defense Technical Information Center (DTIC); the National Technical Information Service (NTIS); and, the technical information center library (Tech Lib) located at Tyndall AFB, Florida. The holdings of the Tech Lib included the proceedings of BSCE 10-21 and other references maintained by the United States Air Force (USAF) Bird Aircraft Strike Hazard (BASH) Team. Citations for the BSCE working papers were entered into the Tech Lib database, maintained at Tyndall AFB. Data from the DTIC and NTIS were extracted from current CD-ROM disks that contain citations from 1970-1993.

References were compiled from these sources using Boolean search descriptors. For example, full-text searches of the databases were conducted to identify those references that used both the words "bird" and "aircraft". Those reference "hits" were then saved, downloaded into an American National Standard Code for Information Interchange (ASCII) text file. The resulting ASCII file was imported into Papyrus™, a bibliographic management software program, for manipulation. Papyrus™ is used to generate the final ASCII disk for ABBHA. The ABBHA file can be imported into many word processing software as well as other bibliographic management software. Papyrus™ was available from the Tech Lib to support this project.

The BSCE citations at Appendix I were created with WordPerfect 5.2 (for Windows). These 264 citations were primarily from the working papers presented at the BSCE meetings 10-14 and 18-20. Proceedings from BSCE 1-9 and 16 are unavailable. Due to problems importing data into Papyrus™, citations for BSCE 15, 17 and 21 are not included in this version of ABBHA.

Keyword Development

Keywords allow users to quickly focus their searches on references of most relevance to their study interests. However, unless the keywords are clearly defined, and all references use them (and spell them correctly), the user may not actually find the appropriate citations.

Many of the comprehensive, institutional database sources offer a full-text search capability which can locate key phrases as well as huge lists of standardized keywords. Casual users of these large databases can sometimes get help from their librarian resources to help with the retrieval of

pertinent citations. However, researchers in developing nations may not have easy access to the large databases. Idiomatic language differences could actually limit the efficacy of researchers when searching through these comprehensive databases.

During the compilation of ABBHA, it was decided that a standardized list of keywords was preferable over full-text search capability. For a stand-alone database like ABBHA, keyword standardization was considered important to improve the ability of ABBHA users, worldwide, to locate references of interest. The initial keyword list was proposed during the BSCE 21. Since then, interested members of the Bird Strike Committees Europe, Canada and the United States have made valuable suggestions on the keyword list that were included in the list in Appendix I. The new keywords were assigned to the ABBHA references.

The ABBHA major keywords, in bold type, were chosen to categorize major themes found in the ABBHA citations. Often several crosscutting themes were included in a single citation; these references often were assigned more than one major keyword. Minor keywords can help narrow the search. When appropriate, major bird types (e.g.; gulls) and states (e.g.; Switzerland) were assigned as minor keywords; these additional identifiers are not included in the keyword list.

Use of ABBHA

The ABBHA is downloaded in ASCII format text and can be imported with most wordprocessing or bibliography management software. ASCII allows users of International Business Machines (IBM) Personal Computers, MacIntosh, or personal computer clones to access the ABBHA. The ABBHA format provides the user with the minimum amount of information to decide on the usefulness of a reference and to acquire it from the technical database.

Abstracts do not provide enough information to pursue additional research or to implement bird hazard abatement solutions. For ABBHA to be truly useful, the entire paper referenced must be made available to the interested researcher quickly and at an affordable price. Currently, the complete citations contained in ABBHA are accessible through three major databases: NTIS; DTIC; and, the Tech Lib. A copy of the entire citation can be requested through the respective clearinghouse. Often copies are available with microfiche as well as printed documents. The request should include the accession number for the citation, as a minimum, as well as the author(s), title and date, if available. Send the requests to the appropriate database manager (DTIC; NTIS; or, TECH LIB, respectively) at these addresses:

Defense Technical Information Center
Cameron Station
Alexandria, Virginia, USA
22304-6145

National Technical Information Service
5285 Port Royal Road
Springfield, Virginia, USA
22161

Technical Information Center
AL/EQ-TIC
139 Barnes Drive, Suite 2
Tyndall AFB, Florida, USA
32403-5323

Support of the ABBHA
Like any database, ABBHA will require periodic updates to be useful and complete. No special training is necessary to input information into ABBHA; only consistency which can come from familiarity with the topic. Therefore, an important support requirement is a knowledgeable person to assign the correct keywords and provide quality control on the data entry into ABBHA.

Updating ABBHA from other, institutional databases can be daunting, but once an input format is developed for a technical database, electronic exchange is usually quick and accurate. Importing data with any bibliographic management software requires more technical understanding of computers than direct keyboard entry of the citations. Also, given the incredible amounts of information available on bird hazards to aircraft, maintaining the ABBHA could easily become a full-time job. A biennial update schedule for ABBHA should be sufficient for most research needs and would fit in with the BSCE meeting schedule.

ABBHA's future home
The Tech Lib at Tyndall Air Force Base, Florida, in its support role for the USAF BASH Team, was closely involved in the development of ABBHA and committed to its support. Unfortunately, due to a reorganization of duties and a relocation of the BASH Team to Kirtland AFB, New Mexico, the Tech Lib can provide only sporadic assistance for the ABBHA user. It is unknown whether the same level of support for ABBHA will be available at the BASH Team's new location.

A comprehensive database on bird hazards will play an important role in applying basic research and other studies to reduce damage to aircraft from birds. An organization, such as the BSCE, which has established expertise and experience in these matters should consider supporting a centralized database like ABBHA.

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Bird Attrac
Crops
Garbage
Lights
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Pyrote
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ABBHA KEYWORDS

Bibliography
- Audio-visual
- Literature Survey
- Symposia

Bird Attractants
- Crops
- Garbage
- Lights
- Safe Areas
- Vegetation
- Water

Bird Avoidance
- Airfield Procedures
- Inflight Manuevering
- Mapping Risks
- Preflight Planning
- Warning Systems

Bird Control
- Airfield
- Chemicals
- Exclusion
  - Nets
  - Spikes
  - Wires
- Facilities
- Falconry
- Habitat
- Lights
- Microwaves
- Predators
- Pyrotechnics
- Remote control
  - Aircraft
  - Watercraft
- Repellents
- Shooting
- Sound
  - Bioacoustics
  - Ultrasonics
- Trapping
- Visual
  - Dyes
  - Effigies

Bird Detection
- Electronic
- Infrared
- Observation
- Radar
- Sound

Bird Hazard Management
- Civil Aviation
- Databases
- Design
- Forecasting
- Funding
- Military aircraft
- Notification
- Organization
- Planning
- Reporting
- Surveys
- Statistics
- Training

Bird Identification
- Biochemical
  - Chromotography
  - Serology
- Collection
- Feathers
  - Macroscopic
  - Microscopic
  - Electron Microscopy
- Preparation

Bird Physiology
- Aerodynamics
- Behavior
  - Flight
  - Freeze
- Mortality
- Sensory
  - Auditory
  - Olfactory
  - Tactile
  - Visual
- Tolerance

ABBHA KEYWORDS (Continued)

Bird Populations
- Behavior
- Disease Vectors
- Distribution
- Marking
- Migration
- Resident
- Roosts
- Weather

Birdstrike Engineering
- Aircraft System
  - Airframe
  - Engines
  - Subsystems
  - Transparencies
- Aircraft Appearance
  - Color
  - Lighting
  - Markings
  - Noise
  - Profile
- Bird Testing
- Computer simulation
- Fixed-wing
- Human Factors
- Mathematical models
- Repairs
- Rotary-wing
- Statistics

Legal Issues
- Conservation
- Hunting
- Land Use
  - Agriculture
  - Airports
  - Attractants
  - Facilities
  - Impact Assessment
  - Landfills (Rubbish Tips)
  - Offal Pits
  - Refuges
  - Slaugterhouse (Abbatoir)
  - Wastewater Treatment
- Mishap Investigation
- Policy
  - Regulations
  - Standards
- Public Relations

Popula

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