SUBJECT ANALYSIS

IN AERONAUTICAL LIBRARIES

by

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PREFACE

Existing literature on subject analysis in aeronautical libraries is scarce and scattered. This literature is either very broad in its statements, (e.g. "classified catalogues are the rule in England")[1] or narrates the a plication of a very specific technique to one library in particular, (e.g. "the Lockheed guided missile library uses Uniterm")[2] As a result, the aeronautical librarian and especially the librarian setting up a new library does not always have a precise idea of the tools and techniques of subject analysis available in his fields. He is sometimes ignorant of their existence, their worth, their possibilities or their popularity in other countries. The present thesis will endeavour to fill this information gap and to show that the adoption of tools and techniques for use in an aeronautical library should not be done without great deliberation. It will also show that profound difference in methods of subject analysis exists between North American and European aeronautical libraries.

As far as can be ascertained from a careful examination of lists of theses, this is not only the first thesis on subject analysis in aeronautical libraries, but also the first to give an international

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1 See p. 126.

2 See p. 30.

coverage of any aspect of aeronautical librarianship.[1] That there is wide interest in this subject is shown by the fact that 64 of the 90 librarians who answered the questionnaire have indicated that they would like to receive a tabulation of the answers made to the questionnaire.

Acknowledgements

The writer wishes to express his gratitude to the 90 librarians who answered his queries. He is also indebted to the many librarians who reviewed a tentative list of subject headings and classification systems before the questionnaire was compiled and who gave advice on the whole project; he is particularly indebted to:

R.C. Wright, Librarian,
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G.N. Frenot, Librarian,
Service de Documentation et d'Information Technique de l'Aeronautique, France.

R. Kennedy, Librarian,
Formerly with National Aeronautical Establishment and National Research Council, Canada. Presently with Bell Laboratories, U.S.

M.J. Hurley, Librarian,
Formerly with National Aeronautical Establishment, Canada.

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1 Other theses in the field of aeronautics:

Taylor, C.E. U.S.A.F. Institute of Technology, library, a self-survey. MSLS thesis, Western Reserve University, 1956. 60p. Typewritten.

Beck, Leonard N. The literature of German aeronautical research, 1934-1945. MSLS thesis, Catholic University, 1950. Typewritten.

The writer is also grateful to the Curator of the Special Libraries Association Collection at Western Reserve University for the loan of classification schemes and subject heading lists and to the Staff of the McGill Library School for their kind help and guidance.

TABLE OF CONTENTS

PAGE

LIST OF ILLUSTRATIONS

PAGE

PAGE

PAGE

INTRODUCTION

For the purpose of this thesis, the writer's own definition of "subject analysis" is "The art of determining and recording the subject matter of a publication in such a way that the publication will be readily brought to the attention of a reader interested in the same subject". "Aeronautical libraries" will be considered as those serving organizations that manufacture or operate airplanes, that do research on airplanes or that legislate on matters involving airplanes.

This thesis is a study of the tools and techniques of subject analysis available to the aeronautical librarian. These tools and techniques fall into the following categories: the various formats of catalogues, lists of subject headings, classification schemes, printed catalogue cards, indexes. In each category, the writer will examine and compare the various publications, equipment and techniques available, to determine their comprehensiveness, their timeliness, their popularity, their adaptability and their suitability to various types of aeronautical libraries. The writer will also deal with the problems peculiar to the assigning of subject headings, with the problem of classified vs alphabetical subject catalogues, with abstracts and with the types of users and of searches in aeronautical libraries.

The information needed for this paper has been gathered in

three ways: the personal files of the writer, preliminary discussions and correspondence with other librarians; a literature survey in the fields of aeronautics and librarianship; a questionnaire sent to 164 aeronautical organizations. This thesis is also based to a certain extent on a brief term paper of the same title written by the author in 1957.

The preliminary discussions and correspondence with aeronautical librarians involved librarians in Canada, United States, England and France.

The literature survey covered roughly the period 1936-1958 and intensively the period 1950-1958, this paper being primarily concerned with the current state of the art and only incidentally with history.

A first version of the questionnaire was tested on four Canadian libraries. Following this test, the questionnaire was modified extensively and a new version was then tested on 20 American libraries. This being successful, the questionnaire [1] was sent to the libraries of 164 organizations in 20 countries. To maintain correspondence within manageable proportions, libraries or organizations not dealing with whole aircraft have not been queried. Those are organizations dealing primarily with engines, guided missiles, astronautics, electronics, etc. Libraries in Russia and its satellites were not queried. The writer was unable to obtain enough information on these organizations to enable him to send questionnaires. The questionnaire and the covering letter

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1 See Appendix D

were also translated into French.[1] The French version of the questionnaire was made as similar as possible to the English one, questions being translated and presented in the same order. The English language questionnaire and covering letter were sent to English speaking countries and Scandinavia; French versions were sent to the Latin group of countries. Both versions were sent to libraries in other countries.

The questionnaire was sent to the libraries of 164 aeronautical organizations. Of these, 92 were definitely known to have a library or membership in a library association. The balance were "shots in the dark" of which a great number were successful. The "shots in the dark" were directed at organizations not known to have a library but that could reasonably be expected to have one. The sources used to compile the mailing list are given in Appendix D. 90 answers were received.[2] Of these, 77 either replied to the questionnaire or sent useful information.

The information gathered by the questionnaire is given a strong slant by the fact that most of the large libraries answered, while many of the small ones did not answer. Hence information and statistics given throughout this paper should be taken as more representative of the large than the small aeronautical library.

Throughout this paper, measures of use of various tools

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1 See Appendix D

2 See Appendix A

and techniques apply to the group of libraries that answered the questionnaire. They probably reflect the state of affairs in aeronautical libraries at large, but they do not necessarily do so.

The questionnaire was deliberately and painstakingly limited to 57 questions covering three pages. A longer questionnaire would automatically have brought more detailed information but would also have brought fewer replies. So as not to discourage busy librarians (and lower the number of replies) most questions have been designed so that they could be answered by checkmarks.

Follow-up letters were sent to approximately 20 libraries to gather further information on interesting developments such as locally devised classification schemes and punched card systems. One-half of these librarians replied.

Reporting on the popularity of various tools and techniques, the writer has often been bold enough to divide the world in two parts: "North America" and "overseas". As will be seen, this division is far from being arbitrary, profound differences existing between these two geographic areas.

Note on aeronautical collections

The collections of publications in aeronautical libraries are made up of books, reports (monographs on various subjects published serially), pamphlets and magazines like those of other

technical libraries. However, reports, pamphlets and magazines constitute the important element in most of these libraries, while books are often considered of secondary importance. The reason for this is that aeronautical information is normally published in reports, pamphlets and magazines long before it is assembled in book form. As a result, the most efficient among the tools and techniques under study will often be those that have been primarily designed to index and make available large quantities of short and timely publications on highly specialised subjects.

CHAPTER I

PHYSICAL FORMATS OF SUBJECT CATALOGUES

Answers to the questionnaire have revealed that the following formats of subject catalogues are in use in aeronautical libraries: card, ledger, punched card and Uniterm. The literature search has revealed research on the Batten-Cordonnier-Peek-a-boo retrieval system.

1) GENERAL NOTES ON ALL FORMATS AND ON ORDINARY CARD CATALOGUES:

Four questions were aimed at determining practices with regard to formats:

Question No. 3 "Is this subject catalogue on cards?"

Question No. 4 "Is this subject catalogue in book or ledger form?"

Question No. 5 "Is this subject catalogue on punched cards?"

Question No. 29 "Do you use the Uniterm (coordinate indexing) system of posting subject headings?"

75 libraries answered affirmatively one or more of these questions. Distribution was as follows:

cards	in 70 libraries
ledger	.. 12 ..
punched cards	.. 7 ..
Uniterm	.. 6 ..

The majority of libraries (70) use ordinary cards. Most libraries that use punched cards or Uniterm use ordinary cards for general

publications (such as books) and use other methods for more specialized publications (such as reports); hence the many combinations of formats found:

cards and ledger	in 6 libraries
cards, ledger and punched cards	.. 2 ..
cards and Uniterm	.. 5 ..
cards and punched cards	.. 5 ..

56 libraries have only one format of catalogue. They are distributed as follows:

only cards	in 52 libraries
.. ledger	.. 4 ..
.. punched cards	.. 0 ..
.. Uniterm	.. 1 ..

41 libraries interfile subject cards with author or title cards, (question No. 2). A few libraries indicated or implied that they had no true subject catalogue. How information is retrieved in such libraries is not known.

As to the types of publications indexed in aeronautical libraries; of 75 reporting libraries, 69 have a subject catalogue for their books, 63 for their monographs in serial form and 57 for their pamphlets, (question 6-8).

2) BOOK OR LEDGER SUBJECT CATALOGUES:

Some readers may be surprised to see here a discussion of ledger catalogues in aeronautical libraries. The survey showed that ledger

catalogues were of not little importance in aeronautical libraries and that, in fact, they were used in 12 of 75 libraries. It must be said that only four of these 12 libraries use only a ledger. The eight others use both a ledger and ordinary cards.

Distribution of these 12 ledger catalogues is truly international:

France	1
Great Britain	5
Holland	1
India	1
Italy	2
Spain	1
United States	1

The reader will note the large proportion of these catalogues in England and the lone library using it in North America. In fact, that American library has been dissatisfied with the ledger system and is recataloguing on cards:

> All our current material is now entered on cards, but recataloguing items from the book is a slow process accomplished as time permits. The new system is still more or less on a trial and error basis and for that reason, I would be very interested in your findings...[1]

The library of an English airplane manufacturer uses cards for the major types of publications and a ledger for lesser publications. The librarian writes:

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1 Letter to author dated November 19th, 1958.

> The main scheme of indexing used by me...was the UDC, i.e. for reports, books, pamphlets, some standards and specifications, and for important periodical articles. I also maintained an alphabetical subject index of periodical articles, photographs, etc., considered of shorter-term value. This was a loose-leaf system but I was considering changing it to 8 X 5 cards.[1]

Again we hear a note of dissatisfaction with the ledger catalogue. Incidentally, the desire to change over to 8 X 5 cards also shows that the 3 X 5 format is not taken for granted everywhere. Another English librarian is satisfied with the ledger system and shows no desire to change to a card catalogue:

> Attached is part of our ledger-type catalogue as requested... Each (classification) group has its own register and is divided into three sections for each group and covers reports, periodical articles and summaries respectively. By doing this any technician requiring information should have all particulars of relevant holdings. [2]

In his answer to the questionnaire, the librarian of a Dutch library had indicated that a book-form catalogue was planned. Following a second query by the writer, that librarian expressed strong feeling on the subject of book-form vs card catalogues:

> We are planning to make a book-form catalogue for books and reports only. Our experience is that retrieval from a card-catalogue is not always easy and efficient for the employees wanting information. When only a card-catalogue is available and people want to go through the catalogue, they have to come to the library. As you will know a card-catalogue has to meet special requirements as prescribed by librarian techniques. These techniques are Russian to the men wanting information. So a book-form catalogue should be easy to read by any one and must in several cases be available on the desk of some of the staff employees. It is not our intention to do away with the card-catalogue as this has its special function for the librarian and information officer. [3]

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1 Annotations on questionnaire returned by the librarian.

2 Letter to author dated November 11, 1958.

3 Letter to author dated November 3, 1958.

Book-form subject catalogues distributed to all readers throughout an organization would certainly be preferable to a static catalogue located in the library. However, the problems inherent to such a system seem to have made it impossible to put it in operation. None of the ledger catalogues revealed by the survey were distributed outside the libraries.

The survey has shown that the ledger catalogue is a format of the past in North America, at least for the larger library. Such is not necessarily the case in other countries such as England. It might be of interest to point out that libraries reporting the use of a ledger catalogue are usually smaller (in staff) than the other libraries. In fact, these libraries average a staff of four, while the aeronautical libraries answering the questionnaire have a rough average of 6.7 [1]

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1 This is based on answers made by 72 libraries to Question No. 57 "How many people are working in your library?" In arriving at this figure (6.7) three libraries indicating staffs of 131, 56 and 38 respectively have been disregarded as having a disproportioned effect on the average. The true average would include these three libraries and would be of 9.9.

3) PUNCHED CARDS:

Question No. 5 of the survey "Is this subject catalogue on punched cards" was answered affirmatively by seven libraries regionally divided as follows:

France	1
Germany	1
Great Britain	1
Holland	1
United States	3

Each of these libraries reports using these punched card files for a specialized section of aeronautics as a supplement to a main catalogue of more conventional format. Apparently, none has gone over entirely to punched cards. In the words of the director of a large French aeronautical information service:

> ...It is not desirable for a documentation service like ours, to rely on one mechanical or electronic index. However, we follow closely experiments in that field... 1

This service is studied later in this chapter. The literature search also revealed the use of punched cards at Allied Research (U.S.) The following will now be discussed in some detail on the next pages:

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1 Letter to author dated September 22, 1958.

punched cards at United Aircraft Corp. (U.S.), McDonnell Aircraft Corp. (U.S.), Allied Research Associates (U.S.), Aeronautical Research Laboratories (Australia), Canadair Ltd (Canada), and the Nationaal Luchtvaartlaboratorium's punched card service for the subject of aerondynamic measurements.

Marginal punched cards at United Aircraft Corp. (U.S.):

In reply to the questionnaire, the librarian mentioned that punched cards were used for retrieval of archival materials. Following a second query, the archives librarian was kind enough to send the writer some samples of their cards (see figure 1) and notes which are quoted here almost in full:

> We are using a stock E-Z Sort punched card which was originally developed for literature analysis in the field of chemistry, but which we have adapted to our own purposes. I will describe briefly how these cards are punched, beginning at the left upper edge of the card and proceeding clockwise.
>
> The field marked "century" is used to indicate the decade covered by the document, when no more exact dating is possible. If "2" is punched, the document concerns events of the 1920-1929 period; if "3" is punched, it refers to the period 1930-1939, etc. Frequently a date of publication is more applicable to the document in question. In such a case, the field marked "century" is not punched, and the year date of publication is punched in the following fields. In the sample card enclosed, "5" in the decade field, "2" in the year field, indicate publication (or occurence) in 1952.
>
> The field marked "author and source index" is used for authors only. The first three letters of the family name and the first initial are punched in that order in rows 1-4. Gwinn, W., is therefore punched as GWIW. Since we use a deep punch only, a single punch serves when a letter is repeated. Additional authors are superimposed in the same field.
>
> Each division and subsidiary of United Aircraft Corp. is assigned a number in the direct numerical code field. In the sample card, number 30 is punched for Pratt & Whitney Aircraft. When the top

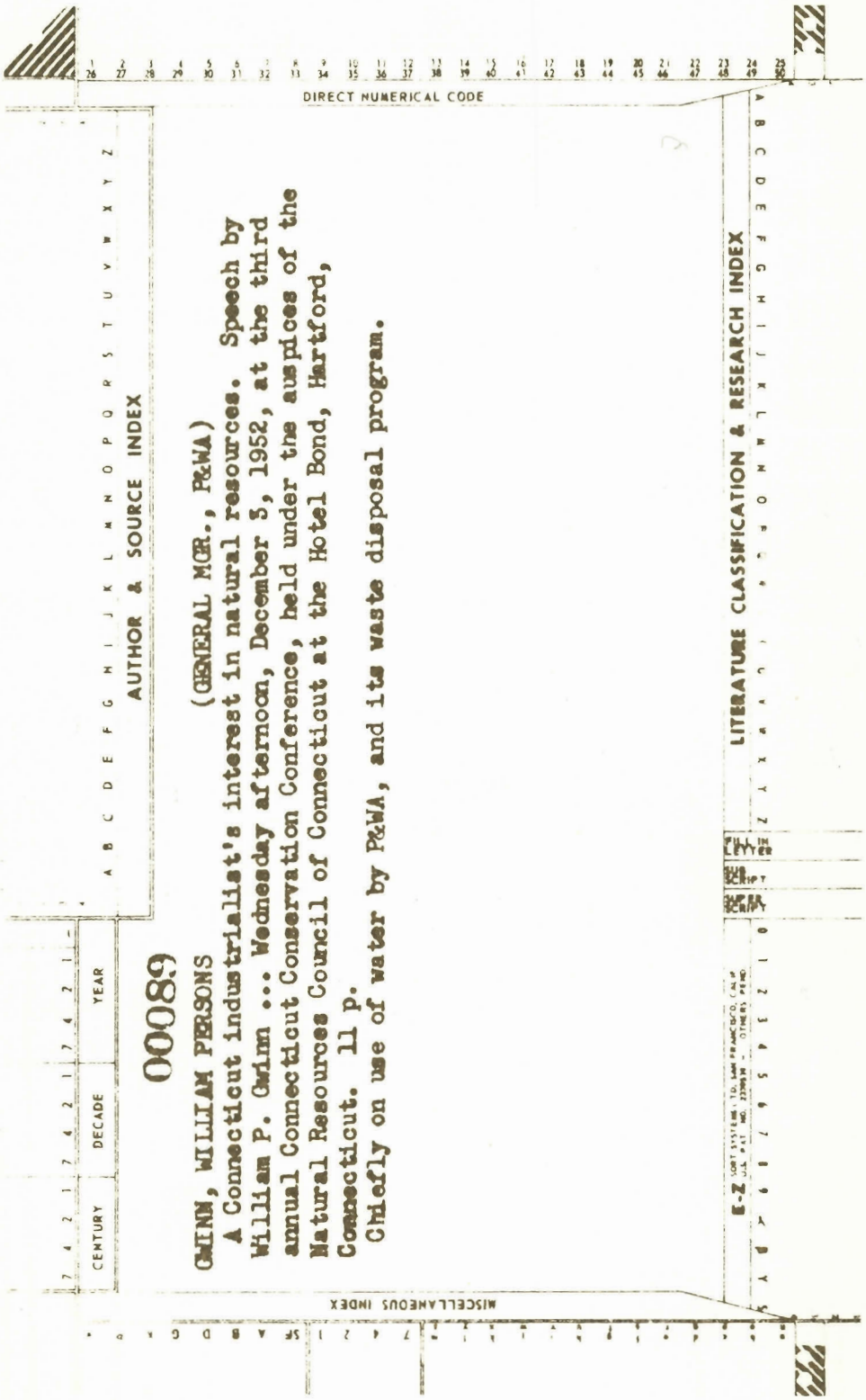

Figure 1. Example of marginal punched card used in the Library of United Aircraft Corp. (U.S.).

row of numbers in this field is used, the top hole in the striped section is also punched, so that, when sorting for number 5, for example, by using a second needle in the striped area hole, only number 5 is retrieved, and not number 30.

The field labeled "literature classification and research index" is used for subject analysis. Each subject is assigned a four-letter code word. The sample card is punched WATR for "water", WSTE for "waste disposal", and TALK for "talks, speeches, addresses, etc.," all superimposed in the same field. Two sorts would thus be required to retrieve all of the speeches by Gwinn: one four-needle sort (in this case three needles, actually, since the "W" is repeated) in the author field for GWIW, and a second four-needle sort in the subject field for TALK.

The subject code is recorded on 3 x 5 cards, one section referring from subject to code word, another referring from code word to subject. An attempt is made to keep the code words as close as possible to the subject word. This mnemonic aid makes it possible to sort for subject directly without referring to the code file in many cases. In the direct numerical code, of course, it will usually be necessary to refer to a list to find the number corresponding to a division or vice versa.

The following three fields are not used. The field which includes the digits 0-9 is used for report numbers, the last four digits of the report number being punched. When there are less than four digits in the number, zeros are punched for those lacking. For example, Report No. 23 is punched as 0023. The remaining edge of the card has been left unused for... further expansion...[1]

The fact that subjects are coded by groups of letters having mnemonic features is of particular interest.

Marginal punched cards at McDonnell Aircraft Corp. (U.S.):

For the following notes and sample, the author is indebted to the McDonnell librarian and to a report of that firm on punched card indexing.[2] Punched cards are used for the indexing of aerodynamic

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1 Letter to author dated October 23, 1958.

2 McDonnell Aircraft Corp. Subject headings used in the Keysort indexing of aerodynamic data. St. Louis, the corp., 1954. Various pagings. (McDonnell Aircraft Corp. Report No. 3779)

data. Classic 3 X 5 in. cards are used for other types of publications.

The punched cards used are McBee Keysort 10½ x 8 in. These cards have two rows of holes on all four sides. Full bibliographical reference and a lengthy abstract are typed on these cards. The major headings run from one to 33 and are preceded by the letter "T". This constitutes in itself an interesting breakdown of the subject "aerodynamics" and part of it is quoted here: [1]

T1 - Test data
T2 - Low speed (M = 0 to 0.3)
T3 - Subsonic (M = 0.3 to 0.7)
T4 - Transonic (M = 0.7 to 1.3)
T5 - Supersonic (M = 1.3 to 3.5)
T6 - Hypersonic (M = 3.5)
T7 - Data on test facility (Wind tunnel, Water table, Instrumentation, etc.)
T8 - Complete airplane
T9 - Components alone
T10- Lifting surfaces (Wings, Tail surfaces, Flat plates)

A direct code is used for these major subdivisions. It consists of only one hole per subject across the top of the card. As an example, the holes 1, 19, 8, 20, etc. will be notched to indicate T1 (Test data), T19 (Performance data), T8 (Complete airplanes), T20 (Lift), etc.

The 33 major divisions are subdivided and completed by approximately 2,000 subdivisions. Each one is given a code consisting of three random numbers. As an example, "Vertical take-off airplanes"

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1 McDonnell, op. cit. p.4.

is coded 60-78-88. The superimposed coding for these numbers is punched into the three remaining edges of the card.

The complete list of major and minor divisions has been internally published as a company report by McDonnell and distributed to personnel concerned: [1]

> This report is available to any engineer whose work requires the use of aerodynamic reports. Before calling or visiting the Library, he may determine whether the library has data on a certain subject by turning to that subject in this report. If a code number has been assigned, there are data containing information on that subject in the library. [2]

Marginal punched cards at Allied Research Associates (U.S.):

Allied Research is "engaged in research and engineering in the broad field related to the aeronautical sciences" [3] 5 X 8 in. marginally punched cards are used. These cards have 40 positions at the top and 40 positions at the bottom. This being a punched card system installed by the Zator Co., the process of cataloguing and coding is called "Zatocoding" and the subject headings are called "descriptors". These "descriptors" are broad subject headings such as "fuselage" and "towed aircraft". There are only 250 in use in the system. Each

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1 McDonnell, op. cit.

2 McDonnell, op. cit. p.3.

3 Brenner, Claude W. Experience in setting up and using the Zatocoding system. (In Shera, Jesse H. . and Perry, J.W. eds. Information systems in documentation. New York, Interscience Press, 1957. p.178-192)

one of these subject headings has a precise meaning for Allied Research and this meaning can be found readily in a "descriptor dictionary" that has been compiled locally. For coding and retrieval a four-number code is assigned to each "descriptor". Code numbers are random superimposed. Retrieval is made by means of multiple-needle sort. "Descriptors" are assigned by engineers.

This is a small system (250 subject headings, 5,000 documents) in use in a small organization (135 people). It has been very successful at replacing an inadequate conventional card catalogue that had been set-up by non-librarians.

Marginal punched cards at Aeronautical Research Laboratories (Australia):

In 1954, a paper was written outlining a proposal of the Library of Aeronautical Research Laboratories to develop a punched card system for structures in aeronautics. A tentative list of subject headings based on previous work was even drawn up.[1,2,3] However, this venture apparently never passed the planning stage. In their reply to the survey, the Aeronautical Research Laboratories reported that no punched card catalogue was in use in their library.

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1 Solvey, J. A punch card system for structures. Farnborough, Eng., Royal Aircraft Establishment, 1954. 6p. (RAE Library Memorandum No. 20)

2 Solvey, op. cit. p.5.

3 Russell, Patricia J. Aeronautical indexing - past, present and future - in the Aeronautical Research Laboratories library. Cranfield, Eng., Association of Scientific Libraries, 1953. (ASLIB Preprint No. 2) See especially p.2-3.

Punched card files independent of libraries. Example: the Canadair Ltd (Canada) IBM punched card index for "fatigue".

It is probable that a number of punched card files existing in various aeronautical firms for subject retrieval have not been revealed by the questionnaire survey and the literature search. Such would be the case of files that are independent of the library and that are set up for the use of a few individuals dealing with a highly specialized subject.

A punched card catalogue of this type exists at Canadair Ltd (Canada) in the Structures Department for the retrieval of references on the subject of "fatigue". A few members of the staff of that department have coded approximately 600 publications on "fatigue". The majority of these publications have been borrowed from the main library, examined, coded into the system and returned to the library. The punched cards are sorted by IBM equipment that is already available for other purposes. An automatic typewriter types lists of the references retrieved. Information retrieved consists of author and initials, abbreviated originating body, abbreviated series title, and series number. On the sample card reproduced as figure 2, the legible information retrieved is: Hardrath, H.F. NACA TN 4012. To the users of the index, there is no doubt as to the meaning of this reference, namely: Hardrath, H.F. National Advisory Committee for Aeronautics, Technical Note No. 4012.

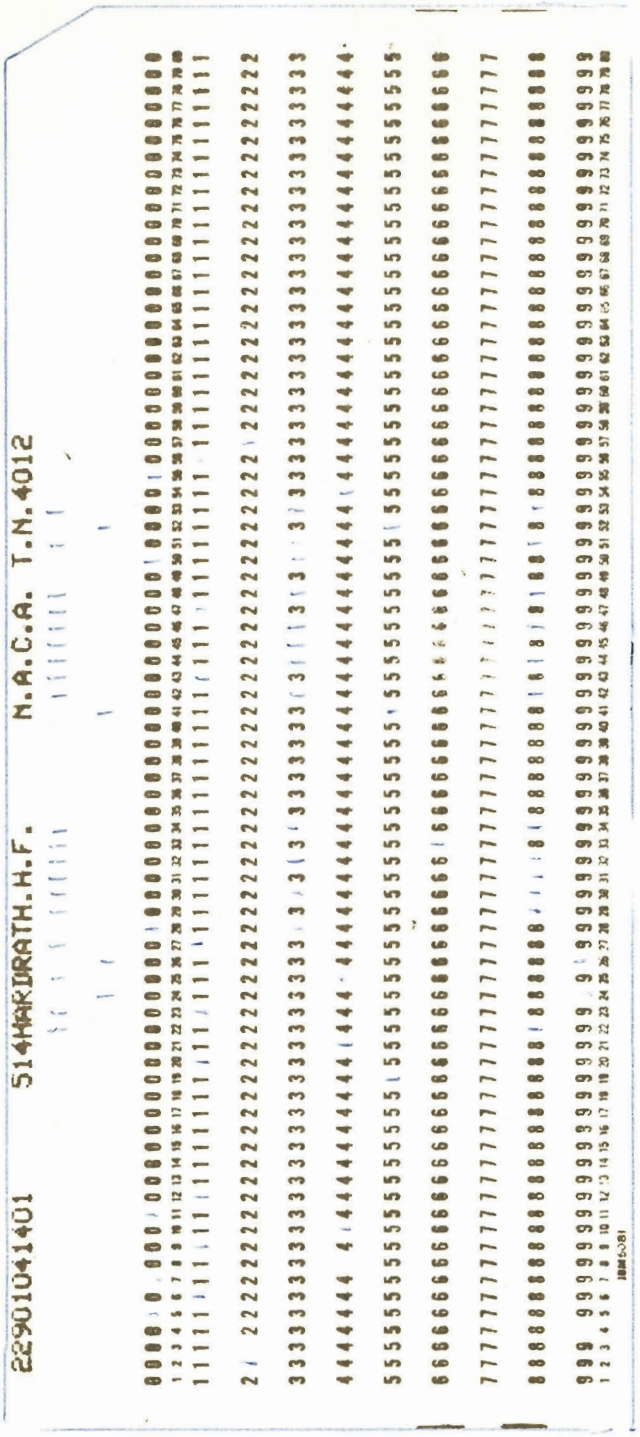

Figure 2. Example of IBM punched card used for the retrieval of publications on "fatigue" in the Structures Dept. of Canadair Ltd. (Canada).

This card was retrieved following a search for

Aluminum (code number A01)

Fatigue (code number D01)

Stress concentration factors (code number F02)

The reader will note the space allotted on the card for encoding of subject, author, publishing body, series, series number and spare space. Space is available for 9999 subjects.

The advantage of Hollerith IBM systems such as this one, over classic cataloguing methods is that they can provide a typewritten list of references. The possibilities for compiling bibliographies and accession lists are interesting.

The Nationaal Luchtvaartlaboratorium's punched card services for the subject of "Aerodynamic measurements":

In Europe, some important aeronautical libraries subscribe to the punched card service "Catalogue of Aerodynamics Measurements" provided in Holland by the Nationaal Luchtvaartlaboratorium (National Aeronautical Institute). This is a ready-made punched card catalogue service that purports to index "nearly all existing newly published unclassified reports and all important articles on experimental aerodynamics published in periodicals all over the world". [1] The English language is used throughout. As this catalogue is concerned with a limited field and does not cover publications such as militarily classified reports, subscribing libraries have also to maintain a

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1 Nationaal Luchtvaartlaboratorium, Amsterdam. Promotional letter to potential users of punched card service. Copy to author September 2, 1957.

general catalogue for the balance of their collection. This service is available in two formats: marginally punched cards and IBM (Hollerith) cards. The service was started in 1953 with the marginal punched cards. The IBM service was added in 1955. By March 1958, 4700 marginal punched cards and 300 IBM cards had been published. It was estimated that 1600 new cards of both editions would be published yearly from then on.[1] This being a unique and extremely interesting endeavour, at least in the field of aeronautics, each of the two formats (marginal and IBM) will be studied here in some detail.

The marginal punched card version of the NLL service:

Cards used measure 9½ X 7 in. and are perforated all around by a single row of holes. Cards contain full bibliographical reference and a great amount of data of interest to the aerodynamicist.

Random superimposed coding is used and irrelevant cards are sometimes obtained. Direct coding has been applied to major headings such as aircraft components, tunnels, mechanics of flight, etc.[2,3]

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1 Letter to author dated March 3, 1958

2 De Kock, A.C. Description of the N.L.L. card catalogue of aerodynamic measurements. Amsterdam, Nationaal Luchtvaartlaboratorium, 1955. (NLL Report F. 173) p.7.

3 Hagedorn, A.C.F. and De Kock, A.C. Description of the N.L.L Hollerith card system catalogue of aerodynamic measurements. Amsterdam, Nationaal Luchtvaartlaboratorium, 1957. (NLL Report F. 203) p.4.

The 168 available holes are used as follows:

47 direct coding of major subjects

6 year of issue

12 first three letters of author's name

85 superimposed coding

9 indicate one of the major groups into which the catalogue is divided

9 reserve

To code publications, the NLL has devised an extensive scheme of knowledge in the field of "aerodynamics", each subject being assigned code numbers. This classification list has a logical hierarchical structure to facilitate its use. However, the numbers corresponding to each subdivision have been assigned for punched card encoding and do not reflect this hierarchy. The main classes are:

Characteristics of flow and condition of models

Aircraft (complete)

Aircraft (components)

Missiles, aerodynes and aerostats (other than aircraft)

Bodies (other than aircraft components)

Flow with free surface

Equipment and methods

Results

Mechanics of flight

As an illustration, the third group "Aircraft (components)" is divided as follows: [1]

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1 Hagedorn and De Kock, op. cit. p.5-9 of subject index.

General

Wing: section

Wing: planform

Wing: devices

Wing: position, shape, etc.

Tail: type, location

Tail: components

Fuselage, hull, body: geometry

Fuselage, hull, body: configuration

Powerplant: engines

Powerplant: propeller, rotor

Other aircraft components

The breakdown for the subdivision "powerplant: engines" is given on the following page.[1] Two pairs of numbers are given for each subdivision. The first pair of numbers are code numbers for the marginal punched cards, while the second pair are for IBM cards.[2] This gives an idea of the logical structure of this scheme and of the very detailed breakdown.

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1. Hagedorn and De Kock, op. cit. p.8. of subject index.

2 Hagedorn and De Kock, op. cit. p.4.

	Marginal number	IBM number
Powerplant: engines		
type		
reciprocating engine	84.102	59.8
turboprop	87.124	60.8
turbojet, bypass engine	75.114	61.8
ramjet	88.133	62.8
pulse-jet	118.142	63.8
rockets, rocket motors, RATO-units	104.127	64.8
JATO-units	90.110	71.8
number and location		
symmetrically powered	not assigned	
asymmetrically powered	80.83	65.3
tip drive (e.g. tip driven rotor blades)	93.117	58.8
single engine	not assigned	
multiple engine	94.111	67.8
no powerplant (glider)	101.128	43.8

Vessey, reporting on the retrieval potential of this format of the NLL index, said that:

> ...the results of the test of the NLL system made by the author were very promising in the percentage of retrieval, but were disappointing in that the majority of failures were due to insufficient indexing. [1]

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1 Vessey, op. cit. p.5 and 15.

In 1955, Vessey reported this marginal punched card version of the NLL index as being in use in four British and one French organization. The questionnaire survey, however, has indicated the NLL index as being in use in only one of these organizations. This may mean that, in these organizations, the NLL cards are not under the jurisdiction of the library or that the subscription has been discontinued. The library of the National Aeronautical Establishment (Canada) used this service for some time circa 1954 and abandoned it. In a conversation with the librarian, slowness of retrieval was given as one reason for discontinuing the service. No information is on hand on other aeronautical libraries using this service, although it is understood that there are others.

The IBM (Hollerith) card version of the NLL service:

Hagedorn and De Kock describe as follows the use made of the space available on these IBM cards:

> Each Hollerith card contains 80 columns, each of which contains 12 punching positions. Of these, 10 are indicated by the numbers 9, 8,...,0. The 11th and 12th punching positions are at the top of the card. These are indicated by the letters x and y. They will be used for coding bibliographic data (author's names; year of issue; etc.)
>
> The first 75 columns out of the 80 that the card contains are used in connection with the classification list. In each of the 75 columns 10 punching positions (numbered from 9 through 0) are used for this aim in such a way that 75 x 10 = 750 punching sites (out of the available 80 x 12 = 960 ones) are available to indicate some item or another of the key. As the key contains some 650 items there is a reserve of about 100 punching sites, which may be used for absorbing extensions of the key if future developments in aeronautical research give rise to this measure. The introduction of such new characteristics

can be made without interfering with cards that are already issued.

> Columns 76 through 80 are used for punching the reference number of the cards, referring to the list of references, an example of which is shown on table 2. This reference number is also printed on the card. The position 76-X is reserved with a view to enable sorting procedures with the help of the collator.[1]

Contrarily to the marginal punched cards published by NLL, the IBM card, once retrieved, contains only an accession number instead of abundant information, diagrams, etc. The user then looks up this number in a numerically arranged "reference list" [2] which gives him bibliographical data such as:

00032

Oppenheim, A.K., E.G. Chilton - Pulsating flow measurement - a literature survey. Trans. ASME, 77, (1955), 2, pp.231-248.

00033

Seddon, J. - The flow through short straight pipes in a compressible viscous stream. RAE Rept. 2542, (1955).

This is still a far cry from the detailed information available on the marginal punched card.

Only a few hundred cards having been processed according to the IBM system, no reports have come to the author's notice on its efficiency or its use in aeronautical libraries other than the NLL's. However, the complicated intellectual and manual operations that accompany retrieval via the IBM method are at odds with the NLL's

---

1 Hagedorn and De Kock, op. cit. p. 5.

2 Hagedorn and De Kock, op. cit. Table 2.

contention that subscribing to this IBM service will "enable you to obtain all specified information from push-button" [1] H. Coblans quotes Warheit to the effect that enthusiasm of punched card users is high at 5000 cards and gradually disappears at about twice that number, searching time being the inhibiting factor. [2] A possible conclusion is that organizations planning to subscribe to the NLL service (marginal version) will acquire it at the height of its utility (5000 cards) but may soon find it cumbersome if cards are added at the planned rate of 1600 cards a year.

The reference numbers on the IBM cards (such as 00032, 00033) have been designed with a view to the future publication of a Batten-Cordonnier-Peek-a-boo version of this index.

Conclusion on punched cards:

At the time of writing, punched cards in aeronautical libraries appear to be used for highly specialized subject areas and seldom or never for an entire library collection. In fact, interest in punched cards for aero collection does not seem to be growing. Witness the abandoning of punched cards at the library of the National Aeronautical Establishment (Canada) and at the Aeronautical Research Laboratories (Australia). The fact that punched card retrieval is not considered in the current comparative experiment of retrieval systems at the College of Aeronautics (England) may also be significant.

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1 Nationaal Luchtvaartlaboratorium, op. cit.

2 Coblans, Herbert. New methods and techniques for the communication of knowledge. (In UNESCO bulletin for libraries, v.11, p.154-175, July.1957)

4) UNITERM:

That aeronautical librarians are interested in the Uniterm system of coordinate indexing is shown by the use of Uniterm in some libraries, by its use in the Pacific Aeronautical Library's "Index of periodicals", by the research on Uniterm done at the Royal Aircraft Establishment (England) and by the current experiment involving Uniterm at the College of Aeronautics (England).

For an explanation of the mechanics of Uniterm retrieval, the reader is referred to the description of the Pacific Aeronautical Library's Uniterm "Index of Periodicals" on page 49. Rosser's brief and clear explanation of the system is worth quoting here:

> In Uniterming, the information in documents is analyzed into basic word-units. Each word-unit is allotted a Uniterm card on which the Uniterm is entered. Accession numbers are given to reports and this number is written on all the appropriate cards, for example, a report "supersonic wind tunnel tests on a swept-wing fighter" would have Uniterm cards:
>
> Supersonic
> Wind tunnels
> Tests
> Wing
> Sweep
> Fighter
>
> If the accession number of this report was 1,000, this number would be entered on the relevant cards. When reports are required on such a subject, these cards are extracted from the index, and by comparing the numbers on them, number 1,000 is found to be common to all. 1

The reader is also referred to the numerous publications of Mortimer

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1 Rosser, J.S. Co-ordinate indexing in an aeronautical library. (In Library Association Record, v.60, p.117, Apr. 1958)

Taube and his associates on the Uniterm system.[1]

The basic theoretical advantage of the Uniterm system is that of reducing the number of entries for combinations of many words. As an example, "swept-wing supersonic fighter" would require only four Uniterms while normal cataloguing would require a choice among 24 possible combinations. If one more term were added, bringing the total to five, there would be, theoretically, 120 possible combinations to choose from in ordinary cataloguing.[2]

The author's questionnaire included the following question:

Question No. 29, "Do you use the Uniterm (coordinate indexing) system of posting subject headings?"

Six libraries answered affirmatively:

1 British research association

1 Dutch airplane constructor

1 Swedish institution

2 American airplane constructors

1 American institution

The librarians of the two American airplane constructors (Convair and Bell) and of the British research association (Aircraft Research) sent sample cards and explanatory notes to the author. The application

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1 Taube, Mortimer and others. Studies in coordinate indexing. Washington, Documentation Inc., 1953-1957. 4v.

2 Cleverdon, Cyril W. and Thorne, Robert G. A brief experiment with the Uniterm system of coordinate indexing for the cataloguing of structural data. Farnborough, Eng., Royal Aircraft Establishment, 1954. (RAE Library Memo. No. 7)

of Uniterm in these libraries and some applications revealed by the literature search will now be discussed individually.

Application of Uniterm at the library of Convair, (U.S.)

Reproduced as figures 3 and 4 are 3 X 5 in. cards and a 5 X 8 in. card as used in the Uniterm catalogue at Convair. The smaller card is used for author entry, title entry, etc., and is filed also in an accession number file (number at top left corner). The larger card bears a subject heading (Uniterm) and accession numbers of publications on that subject. For subject retrieval, these cards are handled as indicated at the beginning of this chapter. Note that Uniterms used contain more than one word. The purpose of dividing the card into columns is to accelerate scanning by grouping all numbers ending with the same numeral in the same column.

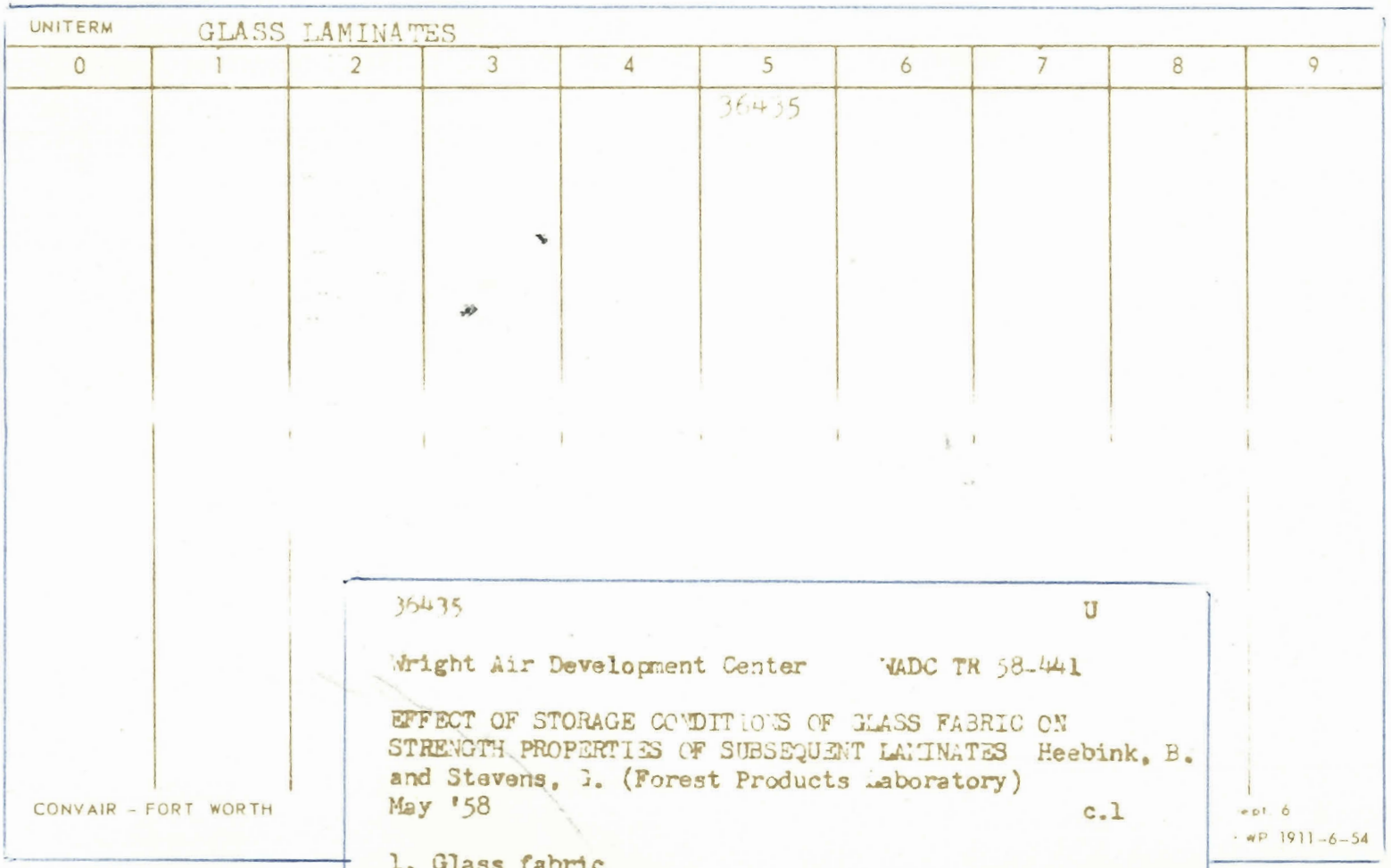
Application of Uniterm at the library of Bell Aircraft Corp. (U.S.)

Formats and utilization are generally similar to those at Convair.

Application of Uniterm at the library of Lockheed Aircraft Corp., Missile Systems Division. (U.S.)

Although the author has not surveyed guided missile libraries for this paper, the following quotation from an article by the librarian may be of interest:

> Coordinate indexing was decided upon for reports. It was felt that necessary information could be catalogued for rapid retrieval by single words more accurately than by phrases or word-groups which



UNITERM GLASS LAMINATES

0	1	2	3	4	5	6	7	8	9
					36435				

CONVAIR - FORT WORTH

36435 U

Wright Air Development Center WADC TR 58-441

EFFECT OF STORAGE CONDITIONS OF GLASS FABRIC ON STRENGTH PROPERTIES OF SUBSEQUENT LAMINATES Heebink, B. and Stevens, J. (Forest Products Laboratory)
May '58 c.1

1. Glass fabric
2. Storage effects
3. Glass laminates
4. Contract DO 33(616)56-9

Rpt. 6
WP 1911-6-54

Figures 3 and 4. Uniterm card and complementary accession card used at the Library of Convair, Fort Worth, (U.S.).

might or might not coincide with searchers' thinking. Also, over a period of years, with several cataloguers working with the file, single terms permit less variation than broad subject heading methods. 1

Application of Uniterm at the library of the Aircraft Research Association, (England).

Since 1952, the Association's library had been using the Uniterm system in the ordinary fashion as described by its librarian (Rosser) at the beginning of this chapter. This library is particularly concerned with aerodynamics and research equipment and techniques. The difficulties that were encountered after a time may be experienced in other libraries using Uniterm. As such, part of their description by the librarian may be valuable here:

> This (Uniterm) system had been introduced at A.R.A. when a report collection first began, and to a certain degree had proved valuable in subject searches. The degree of utility had been limited because, as the report stock increased beyond 1,000 the cards naturally became more and more congested with numbers, additional cards had to be made and subject searching became correspondingly irksome. Several revisions were made, but each time the difficulties became more and more involved and without drastic remodelling, we could see no way of surmounting them while retaining the principles of Uniterms...
>
> We reached the following conclusions after having experimented with the scheme for nearly two years on a fairly large scale:
>
> a) Uniterming was only highly efficient if a limited collection was indexed.
>
> b) If it was intended to use the scheme for a complex collection, some difficulties could be alleviated by starting a new index every 500 reports or so.
>
> c) Uniterm indexing depended for efficiency on adequate

---

1 Robertson, E.L. Launching a missile library. (In Special Libraries, v.47, p.190-4, May-June 1956)

indexing input but, when this was maintained over long periods, the scheme became unreliable and unwieldy.

d) The percentage of irrelevant references (false drops) obtained increased very quickly. This is an extremely important consideration when it is recalled that it is necessary to verify by the accessions register every number obtained from the cards. [1]

Rosser devised a way out of this impasse by classifying his Uniterm index according to the NACA classification system.

e.q.
1. Aerodynamics
1.2 Wings
1.2.1 Wing Sections
1.2.1.2 Sections
1.2.1.2.1 Camber, etc.

As a result, a Uniterm card, instead of bearing the heading (or Uniterm) Supersonic wing theory would bear the notation "1.2.1.1.4 Supersonic (Wing - Theory)". In Rosser's words:

> By employing such a notation, means would be provided not only for filing our index cards, but also for arranging the subject facet list itself into a coherent pattern which would be reflected by the notation... Having combined certain features from a comparatively rigid subject heading schedule and the flexibility of a retrieval system, we are now able to provide means a) to permit a comprehensive outline which was subdivided to a certain convenient stage, b) having reached this stage more detailed and flexible subdivision could be obtained by using cards allotted to different facets, c) information retrieval could be "channelized", i.e., the scope of the search would be clearly defined.

That even with this ingenious modification of Uniterm, all may not be plain sailing is reflected in Rosser's comment

What the capacity of the scheme is, in terms of the number

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1 This quotation and those that follow are from: Rosser, J.S. Coordinate indexing in an aeronautical library. (In Library Association Record, v.60, p.117-119, Apr. 1958)

> of reports that can be efficiently indexed without the difficulties experienced with Uniterm creeping back, we do not yet know. If such difficulties arise, a new index can be started and the information in the discarded index stored separately or relegated to an orthodox subject index...Plans are now being discussed for applying the data...to tapes which could be fed into a ...computer

Research on Uniterm at the Royal Aircraft Establishment. (England)

This experiment involved the indexing of 500 structural documents twice by the Uniterm method (two different indexers) and once by UDC. These documents were Royal Aircraft Establishment "Reports Structures" and "Technical Notes Structures" and National Advisory Committee for Aeronautics (U.S.) "Technical Notes". Retrieval resulting from a subject search for 40 of those reports was: [1]

	First Uniterm index	Second Uniterm index	UDC catalogue
Total failures	6	7	20
Total relevant items	21	18	22
Total irrelevant items	22	14	6

The report from which the above figures have been taken concludes:

> The Uniterm System of Coordinate Indexing merits further study as a method of retrieving highly specific information...It is believed that a careful analysis of the vocabulary used in the Uniterm system is required. An example of one of the problems that occur is that sets of different Uniterms each of which merits inclusion in the vocabulary, that is, are not synonyms or homonyms, may be used by different searchers...The number of irrelevant references produced in the experiment is high and require special

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1 Cleverdon, op. cit. p.16.

> consideration. The present sample of reports is considered too small to justify comment at this stage... [1]

This research work on Uniterm is currently being continued on a larger scale at the College of Aeronautics (England).

Current experiment involving Uniterm at the College of Aeronautics (England).

The purpose of this experiment is to determine the relative merits for aeronautical libraries of the four following retrieval systems: UDC; an alphabetical subject list; a special faceted classification; Uniterm system. For a general description of this experiment, see page 131.

Other applications of Uniterm

In 1955, Vessey reported on the following application of Uniterm in an aeronautical library:

> The U.S. Naval Ordnance Test Station is using the Uniterm Index "Aircraft Instrumentation Data Presentation and Human Engineering Survey" prepared by Documentation Inc. under contract from the Office of Naval Research. Control tests have not been done but experience, on the whole, appears to be satisfactory. Remarks are however made on the difficulty of assigning correct and adequate terms (averaging about nine per report) and of the visual co-ordination of the accession numbers on the Uniterm cards when used for retrieval. It is stated that plans are underway to transfer the index to magnetic tape and use the IBM 701 calculator in searching for information on a particular subject. [2]

The reader will note that both this Test Station and Aircraft Research

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1 Cleverdon, op. cit. p.12.

2 Vessey, H.F. Report on retrieval systems II. Paris, Advisory Group for Aeronautical Research and Development, Documentation Committee, 1955. (AGARD/Doc/6.4) p.4 and 6.

Association are slightly dissatisfied and are looking towards computers for help. Documentation Inc. has compiled an extensive Uniterm index in the field of aircraft components.

The questionnaire survey revealed that Fokker Aircraft Co. (Holland) use Uniterm for firm catalogues. The Royal Institute of Technology (Sweden) also use it; it is not known for what type of publications. The Pacific Aeronautical Library (U.S.) use Uniterm for their commercially available printed index. This special case is discussed on page 147.

5) "PEEK-A-BOO" - RESEARCH DONE AT THE ROYAL AIRCRAFT ESTABLISHMENT (ENGLAND):

The questionnaire did not include a question on the Batten-Cordonnier- "Peek-a-boo" retrieval method nor did any librarian volunteer information to the effect that the system was used in some aeronautical library. However, the literature reveals that an experiment was set up at the Royal Aircraft Establishment to examine the feasibility of publishing a Peek-a-boo index for some 6,000 reports published by the Aerodynamics Department of that Establishment. In this experiment, a locally devised aerodynamics classification scheme was used. Wright and Wilson report:

> 700 reports had been indexed...ten RAE aerodynamicists were asked to collaborate by selecting 10 documents each from the collection and framing one question on each document...
>
> Of the 100 question put, 54 were answered at the first search... In 7 cases the search was "partly successful...and in 15 cases the search failed completely. An overall success percentage of 78 (plus a further 7% of cases in which the field was appreciably

> narrowed) is not unsatisfactory, having regard to the circumstances in which the test was made...
>
> The combination of subject classification and peek-a-boo appears to have many advantages as a means for the analytical indexing of documents in a well-defined subject such as aerodynamics. There would appear to be a market for the commercial development of "miniaturised" cards or plates having a capacity of 20,000 or more positions...[1]

This experiment does not appear to be completed yet. In the Peek-a-boo system, large cards are assigned a subject each such as "wings" or "flutter". Space on these cards is divided into squares, each square being given a number corresponding to the accession number of a publication in the library. If a report bearing the accession number 2234 is on "flutter of wings", a hole is punched in the square "2234" of the card on "flutter" and on the card on "wings". When searching for references to flutter of wings, the cards "flutter" and "wings" are superimposed and light is seen to shine through the hold "2234". This indicated that publication No. 2234 is on "flutter of wings". Difficulties are encountered for large collections due to the limited number of holes on a card, hence Wright and Wilson's recommendation for the development of "cards or plates having a capacity of 20,000 or more positions".

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1. Wright, R.C. and Wilson, C.W.J. Classification with Peek-a-boo for indexing documents on aerodynamics: an experiment in retrieval. (In International Conference on Scientific Information, Washington, 1958, Preprints of papers. Washington, National Academy of Sciences and National Research Council, 1958. Area 4, p.112,113,117)

CHAPTER II

PRINTED CARDS

Reports published by various organisations, very often form the most important part of the collection of an aeronautical library. Fortunately for librarians, the major publishers of these reports now accompany many of their reports by sets of ready-made printed cards. These cards are usually bound at the end of the report and only have to be cut out.

The reports under consideration here are those monographs on various subjects that are published serially by research organizations. The former librarian of the National Aeronautical Establishment (Canada) describes as follows the importance of research reports and the indexing problem that they create for libraries:

> Aeronautical information workers...would claim that reports form the most valuable element of their information resources and require more precise and thorough exploitation than possible or practicable with the conventional methods of organising and using journals and books...
>
> In this era of volume report production, the waste resulting from individual indexing of the same report by perhaps thousands of recipients must be immense. Apart from this colossal duplication of effort, the complexities of research reports and the necessity of processing them quickly have undoubtedly engendered much casual, incomplete and unrewarding indexing. Lack of knowledge,

> of time and of indexing staff has prevented too many special libraries from exploiting their research reports as they might, to the distinct disadvantage of the library user.[1]

Answers to the questionnaire confirm the importance of reports in aeronautical libraries: of 75 libraries that indicated that they had a subject catalogue (answered question No. 1 affirmatively), 63 indicated that their subject catalogue included monographs in serial form (answered question No. 7 affirmatively). Fortunately, as we have said before, ready-made printed cards have come to the rescue.

In 1954, Kennedy estimated that, including all fields of science, at least 50 organisations in the Western world provided cards with many of their technical document series and that more than 5,000 reports issued each year in aeronautics and allied fields contained catalogue cards.[2]

> Yet curiously enough, the idea of issuing cards with reports was slow to spread. By the time the Documentation Committee of the N.A.T.O. Advisory Group for Aeronautical Research and Development convened at Cranfield, England, in March 1953, for its first meeting, the only other (than NACA) large aeronautical research establishment, distributing reports widely, which had adopted the practice was the Royal Aircraft Establishment.[3]

At the time of this writing, five years later, the NACA (National Advisory Committee for Aeronautics, U.S.) and the Royal Aircraft

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1 Kennedy, R.A. Catalogue cards issued with research reports. Paris, Advisory Group for Aeronautical Research and Development, 1954. (AGARD/DOC/4.2) p.3.

2 Kennedy, R.A. The practice of issuing catalogue cards with research reports. Paris, Advisory Group for Aeronautical Research and Development, 1954. p.4.

3 Kennedy. R. A. . Catalogue cards issued with research reports, p.4.

Establishment (England) are still the largest distributors of printed cards in the field of aeronautics.

Whereas in 1954, Kennedy listed 13 aeronautical organizations [1] as issuing printed cards, answers to the questionnaire have revealed 14 additional ones, bringing the current total to 27. To gather this information, Question No. 55 was used: "Does your organization issue ready-made catalogue cards with its research reports?" 14 of these organizations are in North America and 13 are in Europe.

Printed cards are discussed here at length in this chapter principally because they are a solution to a great subject retrieval problem. Apart from helping to solve this problem, they have a manifold influence. They set an example of sound cataloguing in libraries that otherwise would have no knowledge of up-to-date methods; they promote the 3 X 5 in. card catalogue and discourage other sizes of cards and less suitable catalogue formats. In Kennedy's words:

> It may be considered that the relative position and form of information on a catalogue card are trifles of little significance in the communication of aeronautical information. Supplying catalogue cards with reports, however, is decidedly not picayune as a substantial step towards better organization of report literature and hence towards more thorough exploitation of the information, the measure has pronounced values...Catalogue or index cards issued with reports make possible the establishment of precise and authoritative indexes quickly, economically and adequately; the cards are provided when they are required -

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1 Kennedy, op.cit. Catalogue cards issued with research reports. p.6,7.

> immediately upon receipt of the document - and the individual recipient is furnished with his own personal, ready-made card index, complete with abstracts. [1]

The subject headings suggested on some ready-made cards may constitute a trap for the cataloguer using them as they come and without checking against his catalogue or subject authority file. The same may apply to classification numbers. As an example, an indexer may have to change the heading "aerodynamic noise" to "noise, aerodynamic" to be consistent with headings already in use in the catalogue.

Most printed cards contain abstracts. These are invaluable as a subject retrieval tool. Abstracts appear on most of the sample cards shown further in this chapter. This subject is duscussed in more detail in Chapter VIII "Abstracts and abstracting services".

Cards issued by the National Advisory Committee for Aeronautics (U.S.) and the aeronautical sections of the Ministry of Supply (England) will be discussed here in detail and samples shown. Following this, available sample cards from other organizations in the field of aeronautics will be reproduced with some annotations. Cards issued by general agencies such as the Armed Services Technical Information Agency (U.S.) and the Defence Research Board (Canada) will not be discussed although a proportion of their cards deal with aeronautical reports. The Fairchild Corp. card reproduced, although

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1 Kennedy, op. cit. The practice of issuing catalogue cards with research reports. p.6.

prepared by Fairchild, was printed and distributed by ASTIA. Finally, the Library of Congress card service will be discussed with regard to aeronautics.

Cards issued by the National Advisory Committee for Aeronautics (U.S.)

The name of the National Advisory Committee for Aeronautics (NACA) was changed in 1958 to National Aeronautics and Space Administration (NASA). There is no reason to believe that this change will have an effect on that organization's policies with regard to printed cards. NACA were pioneers in the field of printed cards. In one of his monographs, Kennedy discussed the Library of Congress and Wilson cards and goes on to say:

> For aeronautics, however, it remained for the U.S. National Advisory Committee for Aeronautics to introduce in the autumn of 1947 a significantly different type of card service, that of supplying sets of index cards in the reports...Here was a new answer to the problem of establishing precise indexes to valuable documents quickly...[1]

For subject analysis purposes, these carry abstracts, NACA classification numbers and subject headings. The abstracts are rather long; they usually vary between 50 and 150 words. The longer abstracts are continued at the back of the cards. These abstracts are descriptive. The classification numbers are from the NACA's own classification system which is studied in Chapter V "Classification Schemes".

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1 Kennedy, op. cit. Catalogue cards issued with research reports. p.4.

Wide distribution of the NACA printed cards has had a curious effect on the catalogues of many aeronautical libraries, especially in the United States and Canada. On one hand, most of these libraries have alphabetical catalogues; on the other hand, they receive the NACA cards that are designed for use as a separate catalogue classified according to the NACA system. As a result, in many aeronautical libraries receiving NACA cards and reports, two catalogues are to be found: a general alphabetical catalogue for all publications except NACA's and a second catalogue (classified) for NACA publications. (Question No. 11 "Do you have a separate classified catalogue for NACA cards) this figure including some overseas libraries that have a classified catalogue for the bulk of their collection. This is somewhat detrimental in that it slows down searches, users having to look in two catalogues.

There is also a psychological disadvantage in having both an alphabetical and a classified catalogue in the same library. It has been found at Canadair Ltd (Canada) that some searchers have a tendency to use only the general alphabetical catalogue when they are in a hurry and to use both catalogues only when they have plenty of time.

Some libraries have had the time and courage to assign their own subject headings or classification numbers to NACA cards and to merge these cards into their general catalogue. The libraries of the National Aeronautical Establishment (Canada) and of two

American aircraft manufacturers have reported doing so.

Cards issued by the Ministry of Supply (England)

Reports published by the following aeronautical sections of the Ministry of Supply are accompanied by sets of printed cards: Aeronautical Research Council, National Gas Turbine Establishment, Royal Aircraft Establishment. The Marine and Experimental Establishment also deals to a certain extent with aeronautics and prints cards with its reports. The Royal Aircraft Establishment was one of the pioneers of the printed card for aeronautical reports.

These cards contain full bibliographic information and abstracts similar in length and intent to those on NACA cards. No subject headings are given, but UDC numbers are listed. Those of the RAE also bear NACA classification numbers. For libraries having an alphabetical catalogue, these classification numbers can be decoded and found of some use in determining the true subject matter of a publication.

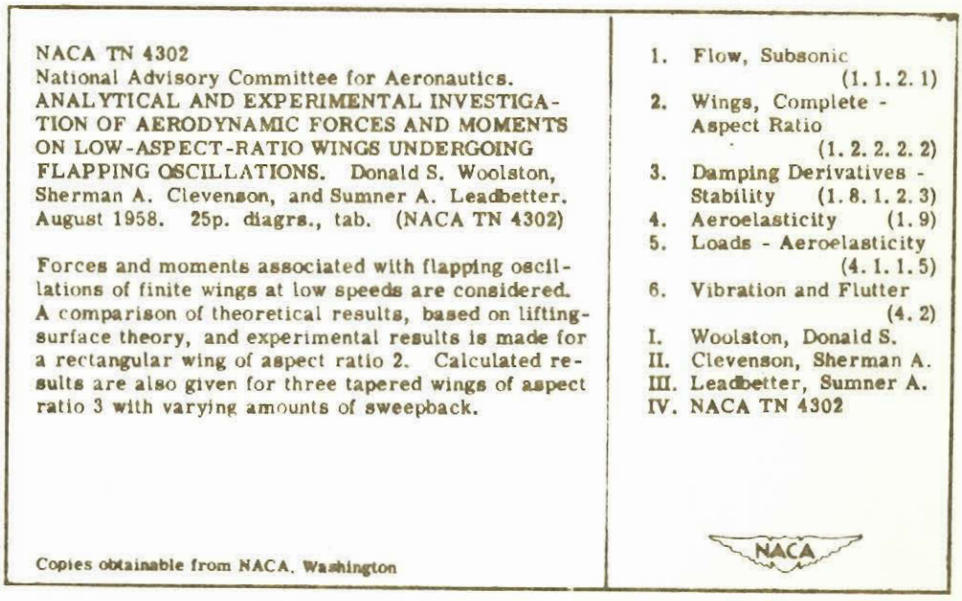
Cards issued by other aeronautical organizations

Reproductions of cards for which samples were available are given as figure 8-19. The reader will note that, as could be expected, European cards usually bear classification numbers while North American cards have been given subject headings.

Cards issued by the Library of Congress

Unlike the cards examined until now, LC cards are published in all fields, are not received automatically with a publication and are for books rather than reports. These cards may be valuable especially to an aeronautical library that has a large book collection and that uses the LC or Dewey classification systems.

The LC subject headings given to books on aeronautics on LC cards are sometimes too broad to fit readily in the alphabetical catalogue of an aeronautical library. Aeronautical libraries may also request the LC to send them automatically one card for each aeronautical publication processed by the LC.



NACA TN 4302
National Advisory Committee for Aeronautics.
ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF AERODYNAMIC FORCES AND MOMENTS ON LOW-ASPECT-RATIO WINGS UNDERGOING FLAPPING OSCILLATIONS. Donald S. Woolston, Sherman A. Clevenson, and Sumner A. Leadbetter. August 1958. 25p. diagrs., tab. (NACA TN 4302)

Forces and moments associated with flapping oscillations of finite wings at low speeds are considered. A comparison of theoretical results, based on lifting-surface theory, and experimental results is made for a rectangular wing of aspect ratio 2. Calculated results are also given for three tapered wings of aspect ratio 3 with varying amounts of sweepback.

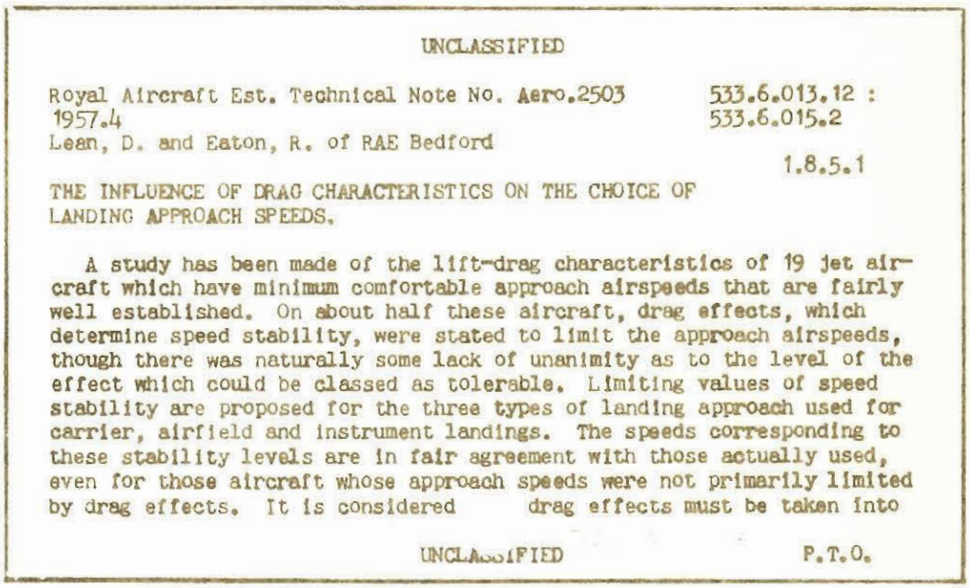
Copies obtainable from NACA, Washington

1. Flow, Subsonic (1.1.2.1)
2. Wings, Complete - Aspect Ratio (1.2.2.2.2)
3. Damping Derivatives - Stability (1.8.1.2.3)
4. Aeroelasticity (1.9)
5. Loads - Aeroelasticity (4.1.1.5)
6. Vibration and Flutter (4.2)

I. Woolston, Donald S.
II. Clevenson, Sherman A.
III. Leadbetter, Sumner A.
IV. NACA TN 4302

NACA

Figure 5. Example of printed card issued by the National Advisory Committee for Aeronautics (U.S.).



UNCLASSIFIED

Royal Aircraft Est. Technical Note No. Aero.2503 533.6.013.12 :
1957.4 533.6.015.2
Lean, D. and Eaton, R. of RAE Bedford

1.8.5.1

THE INFLUENCE OF DRAG CHARACTERISTICS ON THE CHOICE OF LANDING APPROACH SPEEDS.

A study has been made of the lift-drag characteristics of 19 jet aircraft which have minimum comfortable approach airspeeds that are fairly well established. On about half these aircraft, drag effects, which determine speed stability, were stated to limit the approach airspeeds, though there was naturally some lack of unanimity as to the level of the effect which could be classed as tolerable. Limiting values of speed stability are proposed for the three types of landing approach used for carrier, airfield and instrument landings. The speeds corresponding to these stability levels are in fair agreement with those actually used, even for those aircraft whose approach speeds were not primarily limited by drag effects. It is considered drag effects must be taken into

UNCLASSIFIED P.T.O.

Figure 6. Example of printed card issued by the Royal Aircraft Establishment (England).

National Gas Turbine Est. Memo. No. M.259 539.319
1956.1
Glenny, E. and Howe, P. W. H.

-TRANSIENT THERMAL STRESSES IN BRITTLE CIRCULAR CYLINDERS

A method of calculating the transient thermal stresses produced in brittle circular cylinders by rapid cooling has been developed. The validity of the theory has been tested by experiment, using high-alumina cylinders of varying diameter and a fluidised bed as the cooling medium. The preliminary tests show that the theory is substantially correct. Further experiments are necessary to determine whether the theory can be used to predict the thermal shock behaviour of brittle circular cylinders in a variety of materials.

Figure 7. Example of printed card issued by the National Gas Turbine Establishment (England).

AGARD Report 99 North Atlantic Treaty Organisation, Advisory Group for Aeronautical Research and Development Rep.99 CERMETS AS POTENTIAL MATERIALS FOR HIGH-TEMPERATURE SERVICE O.A. Sandven. 1957. 24 pages, incl. 15 Figs., 9 Refs. A review is given of the chemical, physical and mechanical properties of the most important and promising Hard Metals and Cermet systems, with special attention to the creep resistance and ductility. Some experimental results on the system NbC-TiC Ni are reported. Presented at the Fifth Meeting of · Structures and Materials Panel, held from 24th 7th April 1957, in Oslo, Norway	666.762 2a9g2:3e3c5c

Figure 8. Example of printed card issued by the Advisory Group for Aeronautical Research and Development of NATO.

NAE LR-164
National Aeronautical Establishment, Canada.

TURBOJET CYCLE ANALYSIS: THE EFFECTS OF LIQUID INJECTION AT SEVERAL POINTS IN THE CYCLE.
E. P. Cockshutt. April 1956. 25 p. + 8 figs.
(Lab. Rept. LR-164)

The effects of injecting an evaporating liquid into the gas stream in a turbojet engine are calculated for liquid injection both upstream and downstream of the turbine. The response of the peak cycle temperature, engine fuel flow, tailpipe pressure, gross thrust and turbine pressure ratio, to the liquid injection are presented for a range of liquid latent heats and gas Mach numbers. It is shown that pre-turbine injection, unlike tailpipe injection, automatically requires that the engine be overheated when operating with a fixed propelling nozzle.

UNCLASSIFIED

1. Fuel injection, Gas turbine
2. Combustion, Gas turbine
3. Gas turbines - Thrust boosting

I. Cockshutt, E. P.
II. NAE LR-164

Figure 9. Example of printed card issued by the National Aeronautical Establishment (Canada).

DSIS 58/16013 UNCLASSIFIED J

Air Force(US) Office of Scientific Research. AFOSR-TR-57-8, Part 2. THE INFLUENCE OF PROFILE THICKNESS ON RING AIRFOILS IN STEADY INCOMPRESSIBLE FLOW, by J. Weissinger. Jan. 1957.(Contract AF61 (514)-905 with Air Research and Development Command, European Office) 43p. 7 figs 6 tabs 6 refs.

In order to produce profile thickness for ring airfoils contrary to two-dimensional theory - not only a source distribution is needed , but also a vortex distribution. This vortex distribution is determined by an integral equation the kernel of which has been tabulated.The axial velocity at a cylinder covered with sources and vortices in such a way as to produce ring airfoils is given in a form suitable for practical computation .

1. Flow, Incompressible. 2. Aerofoils. i. Weissinger, J. ii. Contract AF61(514)-905.

GEB

Figure 10. Example of printed card issued by the Directorate of Scientific Information Services (Canada).

UTIA REPORT NO. 45

Institute of Aerophysics, University of Toronto

Heat Transfer in a Laminar Boundary Layer at Mach 2.5 From a Surface Having a Temperature Distribution

B. N. Pridmore-Brown February, 1957, 19 pp., 42 figs.,

1. Boundary Layers, Laminar
2. Heat Transfer
3. Aerodynamic Heating
4. Supersonic Flow
I. Pridmore-Brown, B.N.
II UTIA Report No. 45

Heat transfer measurements were made on the outer surface of a hollow cylinder with sharp leading edge at a Mach number of 2.5. The surface of the model was divided into half inch segments, the temperature of which could be controlled and measured individually. Heat transfer results for various surface temperature distributions were compared with the theory of Chapman and Rubesin and were found to be up to 100% higher than their paper would predict (Ref. 1). Good agreement was found with the results obtained by Slack on a cooled flat plate (Ref. 3). Boundary layer pitot traverses were made with a rectangular mouthed probe. The increase in boundary layer thickness due to heat transfer from the model to the flow was found to be greater than that predicted by theory.

A temperature recovery factor of ·77 was obtained for the first element in good agreement with other flat plate rv

Copies obtainable from: Institute of Aerophysics, University of Toronto, Toronto 5, Ontario

Figure 11. Example of printed card issued by the Institute of Aerophysics, University of Toronto (Canada).

U. S. Naval School of Aviation Medicine 30 September 1953

Project Number MM 001 057.16.05

Readability of NavCad Selection Tests.

Robert F. Lockman, U. S. Naval School of Aviation Medicine, Pensacola, Florida.

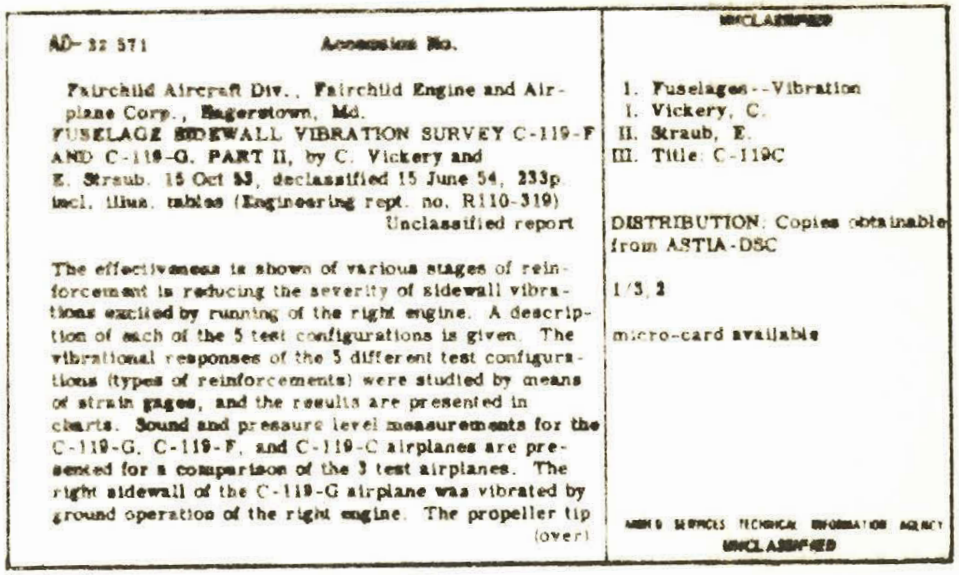
3 pp. 1 table UNCLASSIFIED

This investigation concerned the readability of psychological tests used for selection and experimental purposes with Naval Aviation Cadets. Thirteen tests were analyzed with a modified Flesch readability formula. The readability of the test directions, instructions, and items was computed separately. It was found that all but one of these tests, which is infrequently used, were at suitable levels of reading ease for the range of cadet reading ability.

1. Readability 2. Tests and measurements. 3. Selection.

I. Lockman, Robert F.

Figure 12. Example of printed card issued by the Naval School of Aviation Medicine (U.S.).



AD- 32 571 Accession No.

Fairchild Aircraft Div., Fairchild Engine and Airplane Corp., Hagerstown, Md.
FUSELAGE SIDEWALL VIBRATION SURVEY C-119-F AND C-119-G. PART II, by C. Vickery and E. Straub. 15 Oct 53, declassified 15 June 54, 233p incl. illus. tables (Engineering rept. no. R110-319)
Unclassified report

The effectiveness is shown of various stages of reinforcement in reducing the severity of sidewall vibrations excited by running of the right engine. A description of each of the 5 test configurations is given. The vibrational responses of the 5 different test configurations (types of reinforcements) were studied by means of strain gages, and the results are presented in charts. Sound and pressure level measurements for the C-119-G, C-119-F, and C-119-C airplanes are presented for a comparison of the 3 test airplanes. The right sidewall of the C-119-G airplane was vibrated by ground operation of the right engine. The propeller tip
(over)

UNCLASSIFIED

1. Fuselages--Vibration
I. Vickery, C.
II. Straub, E.
III. Title: C-119C

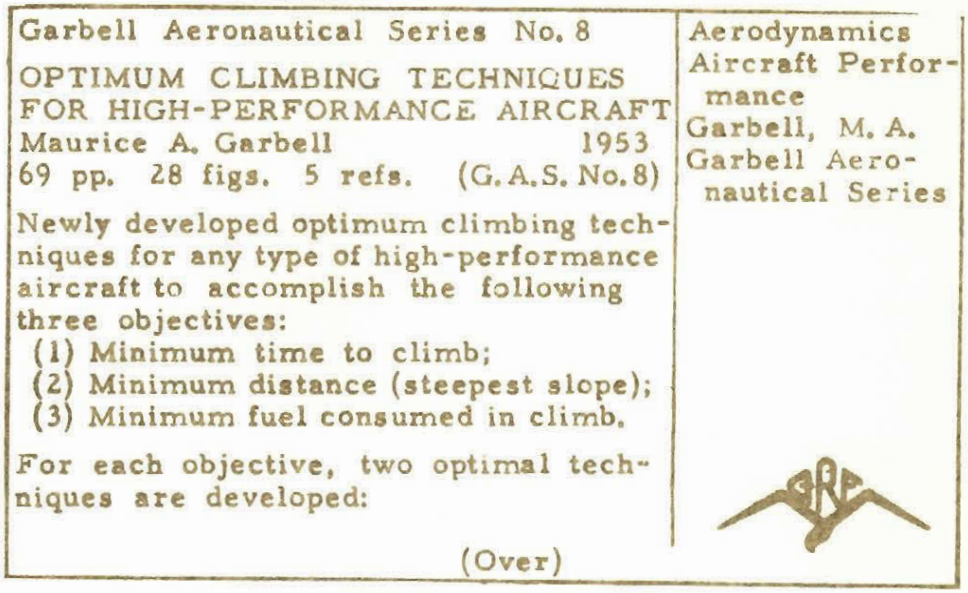
DISTRIBUTION: Copies obtainable from ASTIA-DSC

1/3, 2

micro-card available

ARMED SERVICES TECHNICAL INFORMATION AGENCY
UNCLASSIFIED

Figure 13. Example of printed card issued by the Armed Services Technical Information Agency (U.S.).



Garbell Aeronautical Series No. 8

OPTIMUM CLIMBING TECHNIQUES FOR HIGH-PERFORMANCE AIRCRAFT

Maurice A. Garbell 1953

69 pp. 28 figs. 5 refs. (G.A.S. No. 8)

Newly developed optimum climbing techniques for any type of high-performance aircraft to accomplish the following three objectives:

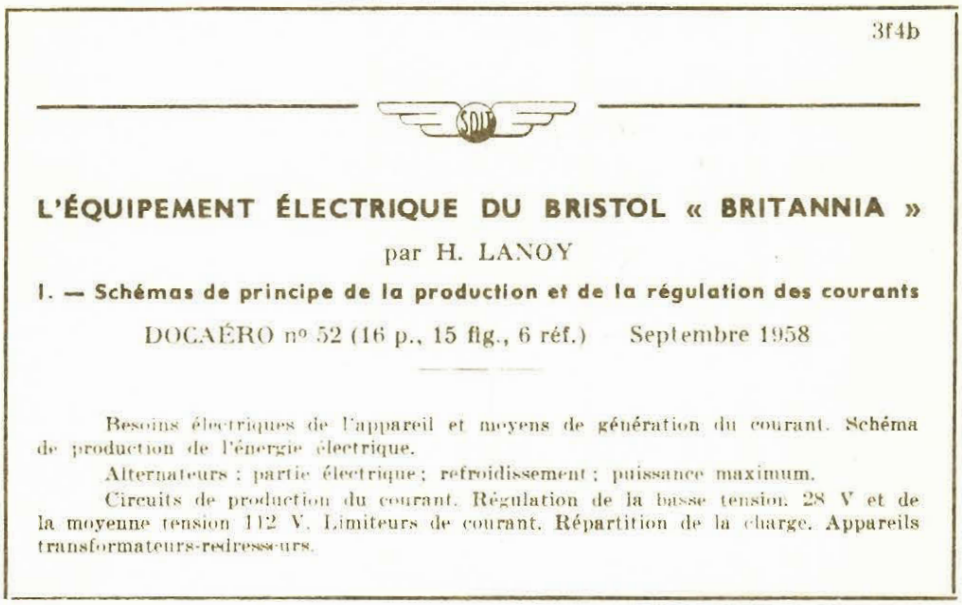
(1) Minimum time to climb;
(2) Minimum distance (steepest slope);
(3) Minimum fuel consumed in climb.

For each objective, two optimal techniques are developed:

(Over)

Aerodynamics
Aircraft Performance
Garbell, M. A.
Garbell Aeronautical Series

Figure 14. Example of printed card issued by the Garbell Research Foundation (U.S.).



3f4b

L'ÉQUIPEMENT ÉLECTRIQUE DU BRISTOL « BRITANNIA »

par H. LANOY

I. — Schémas de principe de la production et de la régulation des courants

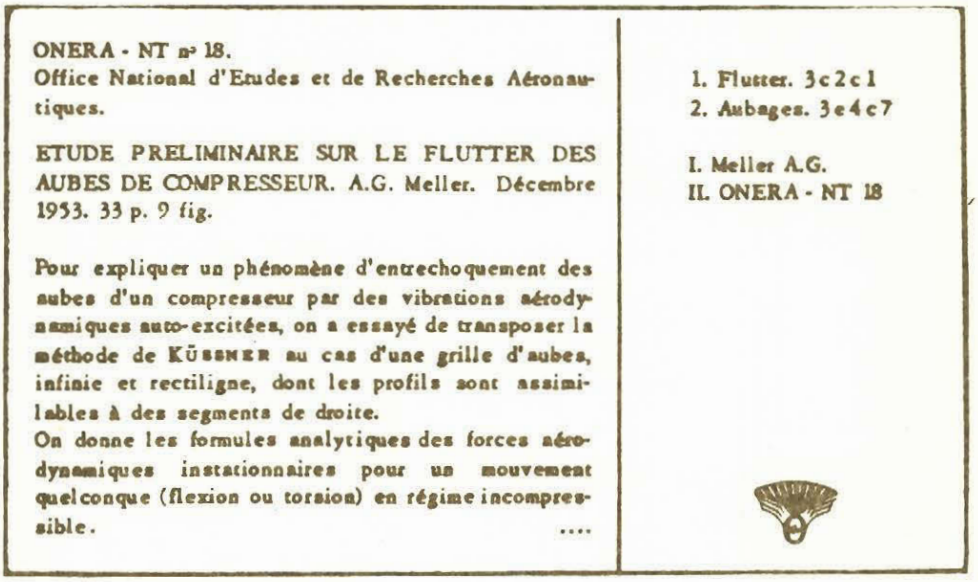
DOCAÉRO nº 52 (16 p., 15 fig., 6 réf.) Septembre 1958

Besoins électriques de l'appareil et moyens de génération du courant. Schéma de production de l'énergie électrique.

Alternateurs : partie électrique ; refroidissement ; puissance maximum.

Circuits de production du courant. Régulation de la basse tension 28 V et de la moyenne tension 112 V. Limiteurs de courant. Répartition de la charge. Appareils transformateurs-redresseurs.

Figure 15. Example of printed card issued by the Service de Documentation et d'Information Technique de l'Aeronautique (France).



ONERA - NT n° 18.
Office National d'Etudes et de Recherches Aéronautiques.

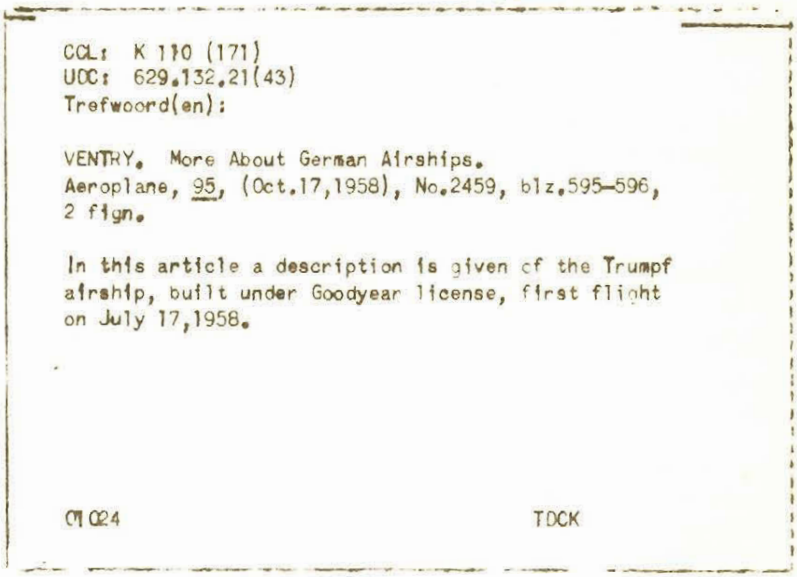
ETUDE PRELIMINAIRE SUR LE FLUTTER DES AUBES DE COMPRESSEUR. A.G. Meller. Décembre 1953. 33 p. 9 fig.

Pour expliquer un phénomène d'entrechoquement des aubes d'un compresseur par des vibrations aérodynamiques auto-excitées, on a essayé de transposer la méthode de KÜSSNER au cas d'une grille d'aubes, infinie et rectiligne, dont les profils sont assimilables à des segments de droite.
On donne les formules analytiques des forces aérodynamiques instationnaires pour un mouvement quelconque (flexion ou torsion) en régime incompressible. ....

1. Flutter. 3c2c1
2. Aubages. 3e4c7

I. Meller A.G.
II. ONERA - NT 18

Figure 16. Example of printed card issued by the Office National d'Etudes et de Recherches Aeronautiques (France).



CCL: K 110 (171)
UDC: 629.132.21(43)
Trefwoord(en):

VENTRY. More About German Airships.
Aeroplane, 95, (Oct.17,1958), No.2459, blz.595-596,
2 fign.

In this article a description is given of the Trumpf
airship, built under Goodyear license, first flight
on July 17,1958.

CI 024 TDCK

Figure 17. Example of printed card issued by the Nationaal Luchtvaartlaboratorium (Holland).

C.C.L. Class. G 042: C 6-4

NLL Report M 1999

National Aeronautical Research Institute, Holland.

RESEARCH ON CUMULATIVE DAMAGE IN FATIGUE OF RIVETED ALUMINUM ALLOY JOINTS.

J. Schijve and F. A. Jacobs. Jan. 1956. 53 pages, 39 figures, 4 tables, 47 refs.

Two-step tests and interval tests were performed on 24 S-T Alclad riveted lap joints to study the cumulation of fatigue damage in this type of joint and to verify the linear cumulative damage rule.
Available data on light alloy specimens are reviewed and compared with the results of the present investigation. It is tried to establish some general trends of the cumulative damage phenomenon. Some proposed cumulative damage rules are discussed with respect to the experimental results and general accepted features of the fatigue phenomenon. Some remarks are made on the life estimation of structures under service loading. Proposals for further investigation are made.

Figure 18. Example of printed card issued by the Nationaal Luchtvaartlaboratorium (Holland).

FFA REPORT 61 533.69.048.3
The Aeronautical Research Institute of Sweden 533.6.011.5
DOWNWASH BEHIND WINGS AT SUPERSONIC SPEEDS.
A SIMPLIFIED METHOD FOR CALCULATION AND EXPERIMENTAL RESULTS FOR WINGS WITH SMALL ASPECT RATIO
Willi Jacobs
52 p., 37 fig., 16 ref. (May 1955)

A simplified method is developed for calculating the downwash behind straight wings with supersonic velocity. For this method a vortex system is assumed consisting of a single bounded vortex and of the free vortices lying in the horizontal plane. The circulation distribution along the span is then approximated by a polynom for the terms of which the downwash field behind the wing is calculated and graphically recorded. The terms of the polynom have such a form that nearly all lift-distributions of practical interest can be approximated with good accuracy. A comparison of the simplified method w' 'xact calculations shows very good agreement.

(over)

Figure 19. Example of printed card issued by the Aeronautical Research Institute of Sweden.

CHAPTER III

SUBJECT HEADING LISTS

The questionnaire revealed the following use of commercially available lists of subject headings: (questions No. 19 to 24)

	Libraries using
Library of Congress. Subject headings used in the dictionary catalogs of the Library of Congress	19
Library of Congress. Technical Information Division. List of subject headings	18
Sears list of subject headings	2
Special Libraries Association. Subject headings for aeronautical engineering libraries	16
Special Libraries Association. Aviation subject headings, a concise list	13
Liste des vedettes-matiere de Biblio	0
Others	2
TOTAL	70

Many libraries use more than one list. In fact, these 70 lists are used in only 32 libraries of which 29 have alphabetical catalogues. One can wonder why only 29 of the 40 libraries having alphabetical catalogues are using commercially available lists of subject headings. Although this was not queried in the questionnaire, reasons for not using available lists of subject headings are probably the following: the lists specialised in aeronautics are not up-to-date; some lists are out-of-print; the existence of some

list may be unknown to some librarians; some librarians prefer to make up their own subject headings; some librarians may have discarded the lists after building up a large and up-to-date subject authority file. Incidentally, to question No. 25 "Do you maintain a subject authority file?" 31 libraries answered affirmatively. 20 of these are in North America and 11 overseas.

1) SPECIALIZED LISTS OF SUBJECT HEADINGS:

Lists of subject headings especially compiled for the aeronautical librarian will now be discussed individually. The reader will note that all but one of these lists have been designed in the United States. This is not surprising considering the lack of popularity of the alphabetical catalogue in technical libraries overseas.

Special Libraries Association. Subject headings for aeronautical engineering libraries. New York. 1949. 245p.

As shown on the previous page, this is the most popular of the specialized lists. As its title implies, it is intended as a tool for indexing engineering literature. It is the joint result of the efforts of major American aeronautical librarians, such as those of the Pacific Aeronautical Library, the Institute of the Aeronautical Sciences, Lockheed, Air University, Boeing, Engineering Societies Library, Air Material Command, etc. As a result, it is well done and is the most usable and the most popular of the specialized lists. However, being now ten years old, it is becoming more and

more incomplete with the growth of its subject field. Some of its headings such as "airplanes, pursuit" are now obsolete while recently developed terminology such as "toss bombing" is obviously not included. This list contains nearly 10,000 subject headings. The majority of these headings are of the inverted type with "see" references from the direct to the inverted form, as in "slotted flaps" see "flaps, slotted". The whole list is abundantly cross-referenced with both "see" and "see also" references. The following excerpt will give an idea of the scope and format of this list:

Fatigue in metals see also Testing equipment; also subdivision Fatigue under specific metals and parts, e.g., Aluminum alloys--Fatigue; Rivets--Fatigue
x Metals--Fatigue
xx Metallography; Strains and stresses

Fatigue in plastics
x Plastics--Fatigue

Feathering of propellers see Propellers--Feathering

Federal control see Government control

Feeder air lines see Air Lines, Feeder

Felt see Fabrics

Ferrous metals see Metals, Ferrous

Ferrying
x Airplanes--Ferrying

Fiberglas see also Plastics, Laminated
x Valinite
xx Glass fibers; Insulating materials
Example under Plastics, Laminated

Fibers see also Fabrics; Textile fibers

Field of fire
x Airplanes, Military--Field of fire
xx Armament; Gunnery

Field of view
x Cabins--Visibility
xx Visibility

Fighter airplanes see Airplanes, Pursuit

In the above "x" stands for a "refer from" in the form of a "see" reference, while "xx" stands for a "refer from" in the form of a "see also" reference.

This list is not strictly limited to aeronautics, but it deals with most subjects on which publications may be found in an aeronautical library, such as plastics, metallurgy, communications, etc. A paragraph from the preface of that list is quoted here as offering a good set of criteria for compiling any specialized list of subject headings: [1]

> What is the most frequent way in which this term is given in the various lists and indexes?
>
> Is this an old Library of Congress term which has been handed down through various indexes without being adapted to present usage of the term in modern technical libraries?
>
> Is the form of this particular term consistent with similar subjects in other parts of the list?...
>
> Is there a special aeronautic meaning to the term which should be retained and a new term used for the non-aeronautical subject?
>
> Is there enough interest in various libraries in this subject

---

1 Special Libraries Association. Subject headings for aeronautical engineering libraries. New York, 1949. Introduction p. iv-v.

to warrant a more detailed breakdown?

How is this subject usually referred to in current technical literature?...

> Special Libraries Association. Aviation subject headings, a concise list for civil aviation libraries or collections. New York, 1949. 56p.

While the larger list studied on the previous pages was intended primarily as a tool for indexing aeronautical engineering publications, the present list is designed for indexing commercial aviation literature. As stated in the introduction:

> The purpose of this list is to provide a tool for the guidance of librarians and others whose responsibility it is to make aviation literature available to the general public... It is hoped that the list, as arranged, will serve adequately cataloguers, file clerks, indexers, research workers and writers in organizing their books or file material. Consideration was given to the needs of air carriers, airport executives, state and local aeronautical agencies, flight schools, aviation writers, public and university libraries with special aviation collections, and school and training personnel interested in the air age education program.

This list is much smaller than the one examined before. It is broader and less technical While dealing with the large SLA list, we have quoted the subject headings from "fatigue in metals" to "fighter airplanes". Using the same example for the present list, we find:

Feeder airlines
Adapt same subheads as given under Airlines

FIDO. See Fog, Intensive dispersal of

Field of view
See also Cabins - Visibility

Randers-Pehrson, N.H. and Renstrom, A.G. Subject headings for the aeronautical index. Washington, Library of Congress, 1940. 106p. (Issued in cooperation with the Institute of the Aeronautical Sciences)

This list had no "vote" among the answers to the questionnaire and, being obsolete, is noted here only for its academic interest. It was quite good and probably the best in 1940. It was done according to regular library methods and was well cross-indexed. However, the newer (1949) lists published by the Special Libraries Association have replaced it.

Institute of the Aeronautical Sciences. Aeronautical subject headings, combined ATI, SAIS, SLA and others. New York, 1949 8 v. Loose-leaf.

Although no library reported using it, this list is as recent as the two SLA lists previously discussed. However, it is much larger, being a combination of many indexes (ATI stands for "Air technical Index" and SAIS stands for "Standard aeronautical indexing system") It is the alphabetical arrangement of the Standard aeronautical indexing system of classification.[1] and has probably been used exclusively as a "key" in libraries classifying their publications according to that system.

1. For a description of the Standard aeronautical indexing system, see p.93.

Nationaal Luchtvaartlaboratorium. List of subject headings used by the Committee for the Classification of Aeronautical Literature. Amsterdam, 1947.

In reply to the writer's questionnaire, the Nationaal Luchtvaartlaboratorium themselves mentioned using this list. Although only the Nationaal Luchtvaartlaboratorium (National Aeronautical Institute of Holland) indicated using this list, it is probable that it is used in the Dutch aeronautical libraries using the "CCL" aeronautical classification scheme as a "key" to that system. [1]

McDonnell Aircraft Corporation. Subject headings used in the McDonnell Aircraft Corporation Engineering Library. St. Louis, 1949. 137p.

This is not a commercially available list of subject headings. In fact, it was designed as a portable, book-form subject authority file. Quoting from the introduction:

> This...list of subject headings used in the McDonnell Aircraft Corporation Engineering Library, is furnished to each member of the library's staff whose work includes the indexing of data. Without this list, there would be no uniformity of subject headings used in the card catalog.

This list was apparently needed because the duty of assigning subject headings was given to various individuals scattered within the firm, hence the following warning in the introduction:

---

1 For a description of the CCL (Committee for the Classification of Aeronautical Literature) classification scheme, see p. 95.

> New headings may not be used unless coordinated with and approved by the member of the library's staff who is responsible for the subject heading list. [1]

Although this is a locally devised list of headings, it is a large list (over 6,500 headings) and much thought has obviously gone into its compilation. The treatment of areas of interest to the firm and of engines, missiles and aerodynamics, among others, is particularly thorough. In the following example, the reader will note the use of inverted subject headings and the fine breakdown of the major headings:

DRAG - MEASUREMENTS
DRAG - TEMPERATURE EFFECTS
DRAG, AERODYNAMIC
DRAG, AERODYNAMIC - AILERONS
DRAG, AERODYNAMIC - ARMAMENT
DRAG, AERODYNAMIC - ENGINES
DRAG, AERODYNAMIC - FUSELAGES
DRAG, AERODYNAMIC - INDUCED
DRAG, AERODYNAMIC - LANDING GEAR
DRAG, AERODYNAMIC - NACELLES
DRAG, AERODYNAMIC - PROFILE
DRAG, AERODYNAMIC - PROTUBERANCES
DRAG, AERODYNAMIC - RADIATORS, INLETS AND DUCTS
DRAG, AERODYNAMIC - SKIN FRICTION
DRAG, AERODYNAMIC - TURRETS
DRAG, AERODYNAMIC - WINDSHIELDS
DRAG, PARASITE
DRAG, WAVE
DRAG, LINK
DRIFT
DRIFT INDICATORS - SEE INDICATORS, DRIFT
DRIFT METERS
DRILLING
DRILLS
DRIVES
DROP TESTS
DROP TESTS, AERODYNAMIC
DRYERS

---

1 Introduction p.i.

DUCTED PROPELLER ENGINES - SEE ENGINES, DUCTED PROPELLER
DUCTILITY
DUCTS
DUCTS, AIR
DUCTS, ENGINE
DUCTS, FLUSH
DUCTS, FUSELAGE
DUCTS, RADIATOR
DUCTS, RECTANGULAR
DUCTS, WING
DUPLEXERS
DUPLICATORS
DURALUMINUM

2) GENERAL LISTS OF SUBJECT HEADINGS:

After examining the specialized lists used in aeronautical libraries, we shall now examine the general "all knowledge" lists used in these libraries.

U.S. Library of Congress. Subject headings used in the dictionary catalogs of the Library of Congress; 6th ed. Washington, 1957. 1357p.

As we have seen before, this list was the most popular in the libraries surveyed. It even ranked in popularity above the specialized aeronautical lists of headings. This is a very detailed list. Its 1357 pages must contain over 100,000 headings and cross-references. This extensiveness combined with the fact that it is brought up-to-date periodically, make it the outstanding list of headings, at least among those that are in the English language and are unspecialized. This list ties in neatly with the Library of Congress classification system, as Library of Congress classification numbers are given opposite most headings. This would fulfill the same time saving role as the Dewey numbers listed

opposite headings in "Sears list of subject headings". Monthly and yearly supplements are published between complete reeditions. In keeping with the detailed breakdown of aeronautical subjects to be found in the Library of Congress Classification System, this list has an extensive coverage of that field. Literally thousands of headings and cross-references are to be found under the subjects aerial, aerodynamics, aerofoils, aeronautical, aeroplanes, air navigation, etc. The breakdown of the subject "Aerodynamics" is given here as an example of the detailed treatment of a small field of aeronautics. All "refer from" references have been omitted.

Aerodynamic control of aeroplanes. See Aeroplanes - Control surfaces
Aerodynamic forces. See Aerodynamic load; Drag (Aerodynamics); Lift (Aerodynamics)
AERODYNAMIC LOAD (TL574.P7)
sa Drag (Aerodynamics)
Lift (Aerodynamics)
AERODYNAMIC MEASUREMENTS (TL573)
Aerodynamical laboratories. See Aeronautical laboratories
AERODYNAMICS (QA930; TL570-574)
sa Aerodynamic load
Aerodynamics, transonic
Aeronautics
Aerostatics
Automobiles - aerodynamics
Blades
Body of revolution
Boundary layer
Cascades (Fluid dynamics)
Downwash (Aerodynamics)
Drag (Aerodynamics)
Flutter (Aerodynamics)
Gas flow
Lift (Aerodynamics)
Mach number
Magnus effect
Reynolds number
Rolling (Aerodynamics)
Stability of aeroplanes
Stability of helicopters
Stability of rockets
Stalling (Aerodynamics)

Turbulence
Vortex motion
Wind tunnels
also subdivision Aerodynamics under subject, e.g. Compressors - Aerodynamics
Aerodynamics, subsonic. See Aerodynamics
AERODYNAMICS, SUPERSONIC (QA930; TL570-574)
ss Shock waves
Supersonic compressors
Supersonic nozzles
AERODYNAMICS, TRANSONIC
Aerodynamics of supersonic flight. See Aerodynamics, supersonic
Aerodynamics of transonic flight. See Aerodynamics, transonic

Of note is the use of direct subject headings whenever possible. Oddly enough, some obsolete (in the U.S.) terms are preferred in this list. Examples are "aeroplane" which is preferred to "airplane" and "aerofoil" which is preferred to "airfoil".

U.S. Library of Congress, Technical Information Division. List of subject headings; 3rd ed. Washington, 1952. 327p.

Within the limitations of the questionnaire survey, this is one of the most popular lists of subject headings in aeronautical libraries (see table at the beginning of this chapter). It even ranks in popularity above the specialized lists (aeronautical) and comes second only to the larger Library of Congress list which we have just discussed.

According to the introduction, this list contains 30,000 headings and is more or less a printing of the subject authority file of the Technical Information Division of the Library of Congress:

> Each heading represents one or more reports actually in the collection of the Technical Information Division...or available to it; therefore, the scope of the list is only as diverse as the collection itself.

In the field of aeronautics, subject headings in this list do not reveal much similarity to those in the larger Library of Congress list. Deleting the "refer from" references, the headings in the shorter list are:

Aerodynamic heating
Aerodynamics
sa Wind tunnels
Aeronautics
Aerodynamics - Bibliography
- Germany
- Handbook
- Test facilities
- Testing equipment
- Theory
- Theory - Bibliography
- Thermal effects

This is scanty. However, we find that many headings that the general list had placed under "aerodynamics" are to be found in the shorter list under "airfoils", and that this breakdown under "airfoils" is extensive:

Airfoils - Aerodynamic characteristics
- Aerodynamic characteristics - Bibliography
- Boundary layer
- Cooling
- De-icing system
- Design
- Downwash
- Drag
- Flutter
- Gust loads
- Heat transfer
- Laminar boundary layer
- Lift
etc.

Direct subject headings, notwithstanding the above example, are used whenever possible. Library of Congress classification numbers are not appended tc the subject headings.

Sears list of subject headings; edited by Bertha Frick. New York, Wilson, 1954. 589p.

This list is designed for the small general library, hence the little use made of it in aeronautical libraries (only two libraries indicated using it). Coverage of the field of aeronautics is very scanty indeed, as could be expected.

Dahl, H.G. Emneordregister for folkebiblioteker. Norwegian Library Association.

This title translates roughly into "Subject headings for public libraries". This list has not been seen by the writer. In its reply to the questionnaire, one library mentioned using it. This is the library of a Norwegian airline. That library has a classified catalogue.

Liste des vedettes-matiere de Biblio. Paris, Hachette, 1954.

Because it was the object of question No. 23.5 of the French version of the questionnaire, Biblio is discussed here briefly, even though it is general and nobody reported using it. Biblio is the rough French equivalent of the American "Sears list of subject headings". Like Sears that it resembles in format, Biblio might be useful in locating simple headings for books outside the field of aeronautics. Coverage for aeronautics is very limited.

3) CONCLUSION ON SUBJECT HEADING LISTS:

If an aeronautical library starts acquiring many publications in a field other than aeronautics (such may be the case for communications, chemistry, plastics, metallurgy, etc.) it may need to acquire the best lists of subject headings that have been devised for that field. As an example, the Canadair Ltd. (Canada) Engineering Library has been trying to locate (without success) a good list of subject headings in the field of electronics. In this chapter, we have not been concerned with such fringe subjects. We have dealt exclusively with lists that the questionnaire survey had reported as being in use in aeronautical libraries. Some of these lists are not commercially available and some are out-of-print. However, many can be borrowed from: Curator, S.L.A. Collection, School of Library Science, Western Reserve University, 11161 East Blvd, Cleveland, Ohio.

Subject headings usable by aeronautical librarians can also be found on printed cards for reports and books, in general indexes to technical literature such as the "Engineering Index" and in indexes of aviation literature such as the "Aeronautical Engineering Index". In the questionnaire, the following question dealt with the use of indexes as a source of subject headings:

Question No. 26 Do you use bibliographical indexes such as "Aeronautical Engineering Index" as a source of subject headings?

"Index Aeronauticus" was the example used in the French version of the questionnaire. Of 75 libraries that had indicated that they had a subject catalogue and of 40 libraries that indicated having dictionary catalogues, 28 answered the above question affirmatively.

As to the type of subject headings used in aeronautical libraries, 19 of the above 40 libraries use mostly one-word subject headings and none uses exclusively one-word headings. (Questions No. 27 and 28) Of those 40 libraries, 13 use mostly direct subject headings and 12 use mostly inverted subject headings. (Questions No. 30 and 31)

CHAPTER IV

CLASSIFICATION SCHEMES

Questions No. 32-42 were designed to gather information on the use of the various classification schemes in aeronautical libraries. In the following table, figures of use are broken down according to geographic location (North America or overseas) and according to the type of catalogue (alphabetical or classified).

Further data to complement this table will be given as each scheme is studied individually. These individual studies will also add some information revealed by the literature search. The total number of schemes in use, according to the table, is 132. That this number is far greater than the number of reporting libraries is explained by the fact that many libraries use more than one classification system. As an example, the Air University Library (U.S.) use Dewey for books and their own system for other types of publications.

	Total libraries using	Libraries in N.America	Libraries overseas	Libraries having alphabetical catalogue	Libraries having classified catalogue
Dewey	16	15	1	15	1
Library of Congress	16	16	0	16	0
Universal Decimal Classification	23	1	22	3	19
National Advisory Committee for Aeronautics	25	13	12		
Standard Aeronautical Indexing System	14	5	9	4	10
Service de Documentation d'Information Technique	3	0	France only	0	3
Committee for Classification of Aeronautical Literature	3	0	Netherlands only	0	3
Cutter	1	U.S. only	0	1	0
ZWB	1	0	Sweden only	0	1
Own locally devised classification	30	13	17		
TOTAL	132				

The following general conclusions can be drawn from this table:

- The majority of reporting libraries use one of five popular classification systems and/or a locally developed system.
- Alphabetical catalogues are popular in North America. Classified catalogues are popular overseas.
- Dewey and Library of Congress are used mainly in North America. Universal Decimal Classification is used almost only in Europe.
- Locally developed schemes are quite popular.

Schemes that are usable in libraries that classify only their books are seldom detailed enough for libraries that classify not only their books but also their reports, pamphlets and other publications. Libraries that classify only their books usually use this classification purely as a shelving device and have an alphabetical catalogue to all their publications. Libraries that classify their whole collection usually have a classified catalogue.

The general "all human knowledge" classification schemes such as Dewey, LC and UDC would appear to be satisfactory for the aeronautical library that classifies only its books. Books in these libraries are much broader in scope than monographs and are often on subjects other than aeronautics. Dewey and LC are used with success for this purpose in Canada and the United States.

Libraries that have a classified catalogue for all their publications have to be far more careful in the selection of a scheme that will deal with all human knowledge or all technology (for many of the books) and at the same time will be extremely detailed in the field of aeronautics (for most of the reports). The only scheme that appears to fulfill these conditions is the UDC system.

Each of the classification systems reported in use in aeronautical libraries will now be studied individually. A few systems especially designed for aeronautics will be discussed, even though the questionnaire survey has revealed no application of these systems. The reader is reminded that when a system is reported in use in a library, this is not necessarily the only system in use in that library. The Cutter classification being a general scheme in use in only one library will not be discussed here. No information is available on the ZWB (Zentrale fur Wissenschaftliches Berichtswesen uber Luftfahrtforschung) classification system other than that this German aeronautical system was popularized before the war through a perforated card service available from Zentrale. [1]

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1 See p. 136.

1) GENERAL CLASSIFICATION SCHEMES:

The collections of aeronautical libraries often contain a great many publications on subjects other than aeronautics, such as electronics, law, business, transportation, management etc. Such fields of interest vary too much with each library to be taken into consideration in this paper. However, because of these fringe fields of interest, a classification scheme that is adequate for one library may be inadequate for another. In this brief study of the Dewey, LC and UDC classification systems, we will have to ignore these other fields of interest and limit the study to the treatment given to aeronautics. The Bliss classification will not be studied, neither the questionnaire survey or the literature search having revealed the use of this system in an aeronautical library.

Dewey classification system

Until the appearance of the 16th edition in 1958 [1] the Dewey system dealt very briefly with the field of aeronautics. As a matter of fact, there were less than 50 classification numbers assigned. No breakdown existed for "aerodynamics".

In the 1958 edition, an effort has been made to improve the aeronautical classification and there are now almost 100 numbers assigned. A simple breakdown for "aerodynamics" has been worked out:

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1 Dewey, Melvil. Dewey decimal classification and relative index, 16th ed. Lake Placid, Forest Press, c1958. V.1, tables. 1409p.

629.1323 aerodynamics of flight
31 forces in gliding, soaring, diving
32 air-flow patterns
33 dynamic lift and thrust
34 drag (air resistance)
35 pressure distribution over wing surfaces
362 control aerodynamics
37 boundary layers

It will be noted that, to subdivide "aerodynamics of flight" even as briefly as this, it has been necessary to use as many as five or six digits beyond the decimal point. The above breakdown seems to have been the major improvement. The other improvements are scattered, such as the addition of a number for "space flight". There is still no worthwhile subdivision of "engines".

With little local expansion or without local expansion, this classification nevertheless enables one to classify the aeronautical books in an aeronautical library. In fact, the librarian of the Missile System Division of the Lockheed Aircraft Corp. (U.S.) reported in 1956:

> Cataloguing of materials, it was decided, should remain as simple as possible. The use of Dewey classification for books was established with an attempt to keep numbers to a maximum of three digits beyond the decimal point. [1]

However, it would be extremely difficult, using the Dewey system, to organise a large number of highly specialised monographs.

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1 Robertson, E.L. Launching a missile library. (In Special Libraries, v.47, p.190-4, May-June 1956)

The questionnaire revealed the use of the Dewey decimal system in 16 libraries, 15 of these libraries being in North America and one overseas. The 15 North American libraries have alphabetical catalogues. It is not clear what type of catalogue the one overseas user has. In all 16 libraries it is used for books and in two libraries it is also used for reports. Three libraries use it with modifications.

Library of Congress classification system

The pattern of use of the LC system is very similar to the pattern of use of the Dewey system given immediately above. The questionnaire revealed the use of this system in 16 North American libraries and indicated no use of it overseas. These 16 libraries have alphabetical catalogues. It is used for books in 13 of these libraries, for both books and reports in two libraries and for only reports in one library. Four libraries use it with modifications.

In the latest edition of this scheme, [1] TL500 to TL830 are devoted to "Aeronautics. Aerial Navigation". The breakdown has at least 550 divisions and many tables suggesting further subdivision. This makes LC far more detailed than Dewey for the field of aeronautics. As an example, whereas Dewey has no breakdown at all for 629.13436 "Propellers (Air screws)" LC suggests approximately 25 subdivisions such as noise, testing, thrust, vibration, hub, spinner, tipping, etc.

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1 Library of Congress, Subject Cataloguing Division. Classification, Class T Technology; 4th.ed. Washington, U.S. Government Printing Office, 1948.

A very detailed breakdown is given for the nearly obsolete fields of "balloons" and "airships" while only a few numbers are assigned to "jet engines" and "aerodynamics". This is a cumbersome legacy from the 1930s. The inheritance from the past also shows here and there in the vocabulary, as in "air-screws". Oddly enough, the French words "atterisage" (sic) and "cinemitrailleuse" are used instead of the available (even 15 years ago) "landing" and "camera gun".

Apart from the detailed treatment of the technological aspects of aeronautics, a few other aspects are also covered under "transportation", "military science" and "law".

Even if some of its parts are deadwood, the aeronautical classification devised by LC would still enable one to classify a collection of books in the field of aeronautics. However, without expansion, it would not be detailed enough for classifying a large collection of reports. This has not been attempted by any of the reporting libraries.

Universal decimal classification

The questionnaire revealed the use of this system in 23 libraries, one of these libraries being in North America and 22 being overseas. Within the limitations of this survey, this makes it the most widely used of the general classification schemes. 19

of these 23 libraries have classified catalogues and three have alphabetical catalogues. In 15 libraries it is reported in use for books, in 12 libraries it is reported in use for both books and reports and in two libraries it is reported in use for reports only. Seven libraries have made modifications to the one or more versions of the scheme that they use.

An interesting example of librarians abandoning UDC and returning to it after some years is given in a letter from the Royal Dutch Airlines (KLM) librarian:

> Before the last world war the UDC was used for classification of aeronautical libraries, though there were not many of these in our country. The UDC did not prove sufficient to meet the requirements...

The KLM librarian then describes the system that was then devised to replace the UDC. This was the CCL system which is described on p. He then concludes:

> At this very moment the aeronautical libraries in the Netherlands, of which there are five of importance, are switching over from "locally devised scheme" to UDC because of less work for keeping up to date for the pure aeronautical headings and because of hardly any work in the related headings.[1]

UDC gives a far more detailed breakdown for aeronautics than the other general classifications. The librarian of the Department of Civil Aviation (Australia) writes:

> We classify all our publications according to the Universal Decimal Classification, which is the most efficient method

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1 Letter to author dated September 24, 1958.

> of classifying the limited field of subjects we cover in greater detail than is possible with Dewey, Library of Congress or other more general classifications.[1]

In 1956, ASLIB (England) Aeronautical Group, formed a UDC Sub-Committee to investigate how the existing UDC schedules were being used in aeronautical libraries. Two questionnaires were used, the distribution being limited to the Group's members who were primarily interested in aerodynamics. 19 English libraries replied. The following are culled from the Sub-Committee's summary of the replies:[2] Of four libraries not using UDC, three had considered using it and had rejected it for the following reasons: lack of depth in UDC and reclassification involved; breakdown insufficiently detailed; own system still works. Eleven use the Royal Aircraft Establishment typescript of 532 and 533.6. Eight use the schedules as they stand; five have made their own modifications. 15 are not satisfied with the schedules as they stand; one is generally satisfied. 12 compile an alphabetical guide to UDC.

ASLIB's work has continued and in 1958 the librarian of the College of Aeronautics (England) informed the writer that: "We recently had a group of people working on 532.5 and 533, and they have prepared new schedules which are now being discussed with other European users"[3]

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1 Letter to author dated August 27, 1958.

2 Questionnaire "The use of the Universal Decimal Classification (U.D.C) in aeronautical libraries", 1956, and "Summary of replies", n.d.

3 Letter to author dated April 25, 1958.

An example of local expansion is given in a letter from the librarian of Short Brothers & Harland Ltd (England): [1]

> In general we use the Universal Decimal Classification as laid down in British Standard 1000A, but, where necessary, extension is made to suit the particular subject. For example 533.69.043.2 "Aerodynamics of aircraft elements in the horisontal plane is extended to:
>
> .21 Swept Back
> .211 Delta
> .212 Double Delta
> .215 Cranked
> .22 Swept Forward
> .23 M Planform and W Planform
> .24 Trapezoidal, Triangular
> .25 Rectangular
> .26 Crescent

Very long numbers such as the above are one of the features of the UDC classification system and may be considered by some as a cumbersome feature. This is compounded when two numbers are combined as in 533.69.043.2:533.6.011.35.

The Federation Internationale de Documentation (FID) publishes extensions and corrections for the UDC.

Four major published versions of the UDC (three in English, one in French) will be examined individually as to their treatment of the field of "aeronautics". Other versions in these languages and in other languages will not be discussed. German and Dutch versions have been reported in use by some aeronautical libraries.

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1 Letter to author dated October 10, 1958.

UDC English abridged

The latest edition [1] has about 100 subdivisions in the field of aeronautics and covers about 200 subjects of aeronautical interest. The breakdown for 533.6 "aerodynamics" is not very detailed. This would hardly be sufficient for classifying highly specialized reports. Even in the abridged form, some of the numbers are very long and run into six decimals.

UDC English unabridged

The English unabridged edition [2] gives a good breakdown of 533.6 "aerodynamics" but 629.13 has not been done yet. This is the reverse of the latest French UDC which gives an extremely detailed treatment of 629.13 but does not subdivide 533.6 The two versions are thus seen to be complementary. The situation in English libraries is not as bad as it may look, breakdowns of 629.13 being found in the English UDC Abridged and in the Royal Aircraft Establishment's revisions and expansions of the French UDC.

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1 Universal decimal classification, abridged English edition, 2nd ed. London, British Standards Institution, 1957. 252p. (British Standards 1000A).

2 Universal decimal classification complete English ed.; 4th international ed., Vol. 2, part 1, Classes 50 to 53. London, British Standards Institution, 1943. 103p.

UDC French unabridged

In the French version,[1] the breakdown of 533.6 "aerodynamics" has not been done yet. The treatment of 629.13 "aeronautical engineering" is extremely detailed. About 350 numbers are assigned. covering over 1000 subjects. This version is the "father" of the versions in other languages.

Like LC, this classification is partly obsolete and contains very detailed breakdowns of subjects such as "dirigibles" which are no longer of primary interest.

UDC., translation, revision and expansion made by the Royal Aircraft Establishment

These translations, revisions and expansions have been made from existing French and English schedules for the RAE's own use and for the use of other English language libraries. Some areas are a close translation from the French. As an example:

	RAE UDC	French UDC
629.13.014	Components for lift and control.	Organes d'orientation. Voilure, Gouvernails.
.1	Lifting surfaces in general. Aerofoils.	Voilure en general
.3	Wings and structural components of wings and ailerons.	Ailes et parties constitutives des ailes et des ailerons
.31	Shape and disposition of wings. Method of increasing or decreasing drag.	Forme des ailes. Moyens pour amoindrir, augmenter la resistance en general
.311	Wing plan. Sweep-back. Sweep-forward.	Forme des ailes.

1 Classification decimale universelle, 5ième édition internationale. Bruxelles, Editions.Mundanaeum, 1940- in progress. 62 Art de l'ingénieur. 1941.

629.13.014.313	Devices for influencing air flow over wing. Slats. Flaps. spoilers.	Dispositif pour influencer le courant aux ailes, p. ex. fentes, ouvertures, etc.

At least in that particular example, the numbers are the same. This holds true for most of the RAE schedules seen by the writer. In the above example .311 "Wingplan. Sweep-back. Sweep-forward" is more precise than "Forme des ailes" (wing shape). .313 "Slats. Flaps. Spoilers" is more precise than "fentes, ouvertures, etc". (slots, openings, etc.).

Sometimes the RAE version is less detailed than the French original. As an example, 629.13.014.331 "Schema d'haubannage" (rigging plan) is not used in the RAE schedules seen by the writer. On the other hand, 656.7 "commercial aviation" which is not subdivided in the French version has been expanded by the RAE. 533.6 "Aerodynamics" has no breakdown in the French UDC. However, a very detailed breakdown of this subject appears in the RAE version. This difference is of great importance to aeronautical librarians. It is to be noted that this subject "aerodynamics" is also fairly well detailed in the English unabridged UDC. The ASLIB is currently revising 532.5 and 533. Revisions will be incorporated in the RAE sheets.

2) AERONAUTICAL CLASSIFICATION SCHEMES (PUBLISHED):

After examining the usefulness of general schemes for aeronautical libraries, we will now consider schemes that were designed exclusively for aeronautical libraries and are (or were) available in printed form.

NACA Classification system

Two questions were used to determine the utilization of the National Advisory Committee for Aeronautics (U.S.) classification system:

Question No. 11 "Do you have a separate classified catalogue for NACA cards?"

Question No. 38 "Do you use the NACA classification system?"

Oddly enough, 31 libraries answered affirmatively to the second. It is possible that some libraries did not consider the act of filing the NACA printed cards [1] according to NACA classification numbers as a real use of the NACA classification system. Studying the lower figure of utilisation (25 libraries) we find that 13 are in North America and 12 overseas. This is not surprising considering the wide distribution of printed cards made by NACA. No library indicated using the NACA system for books. The system appears to be used solely for filing NACA cards and for a few specialised applications such as the one reported at the Royal Aircraft Establishment (England):

> (Cataloguing and classification) procedures vary from one department to another...Aero Department...maintains several card indexes to reports and these are arranged not by UDC but by the NACA classification scheme, which happens to contain a more useful subdivision of aerodynamics.[2]

The NACA classification scheme and relative index are to be

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1 See p. 42.

2 Wright, R.C. and Dyke, Mary. The Royal Aircraft Establishment library service. Farnborough, RAE, 1954. (RAE Library Memorandum No. 12, p.3).

found in the yearly "Indexes of NACA technical publications". The following notes are based on an examination of the latest edition (Index of NACA technical publication, June 1956-June 1957. Washington, National Advisory Committee for Aeronautics, 1957. 265p.) [1] The NACA classification system is divided into 12 classes:

1. Aerodynamics
2. Hydrodynamics
3. Propulsion
4. Aircraft loads and construction
5. Materials
6. Meteorology
7. Operation problems
8. Instruments
9. Research equipment and techniques
10. Nomenclature
11. Bibliographies and indexes
12. Technical summaries

These classes are subdivided decimally, periods being used between subdivisions:

4	Aircraft loads and construction
4.1	Loads
4.1.1	Aerodynamic
4.1.1.1	Wings
4.1.1.1.1	Steady loads
4.1.1.1.2	Maneuvering
4.1.1.1.3	Gust loads
4.1.1.1.4	Buffeting loads
4.1.1.2	Tail
4.1.1.2.1	Steady loads
4.1.1.2.2	Maneuvering
4.1.1.2.3	Buffeting loads
4.1.1.3	Bodies
4.1.1.4	Rotating wings
4.1.1.5	Aeroelasticity
4.1.2	Landing
4.1.2.1	Impact
4.1.2.1.1	Land
4.1.2.1.2	Water

In some cases, "decimals" may be larger than nine, as in 3.12.1.6 "pulse-jet engines".

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1 For notes on this index see p. 155.

As can be seen, this classification is decimal, very expandable and heavily hierarchical. Although it may look very detailed, it contains less than 500 subdivisions. Many of the subdivisions are very broad. As an example, there is no provision for such items as "turrets", "bombs", "tabs" and "strain gauges". "Turrets" and "bombs" have to be given the number for "bodies"; "tabs" have to be given the number for "controls"; "strain gauges" would be given the number for "instruments". The breakdown for "aerodynamics" is particularly sound and detailed.

The various versions of the NACA classification scheme published since 1949 have shown variations. The following examples are based on a comparison of the 1949 and the 1957 editions. The number 1.4.7 for "compressors" has been reassigned to "boundary layer"; "diffusers" which were 1.4.4.1 are now 1.4.2.1; the whole section 1.9 "loading" has been transferred to number 4, displacing the subject "structures" which had number 4; 1.9 which stood for "loading" now stands for "aeroelasticity". These changes in the meaning of some of the classification numbers will make for incomplete subject retrieval unless cataloguers or users take special precautions. Over the years, the scheme has also been expanded in a decimal fashion. 1.2.2.4.3. for "all-movable controls" and 1.2.3.3. for "leading edge flaps" are examples of expansion and addition through the use of further decimals. One must not forget that this system has been disigned by NACA for NACA publications. As a result, the fields of greater interest for the NACA (such as "aerodynamics") may be more developed than others.

Standard aeronautical indexing system

The questionnaire revealed the use of this sytem in 14 libraries, five of these libraries being in North America and nine overseas. The SAIS was designed in the United States. This is the only example of an aeronautical system designed on one side of the Atlantic being in wider use on the other side. The nine overseas libraries and one of the North American libraries have classified catalogues. It is used for books in five libraries, for reports in six libraries and for both books and reports in three libraries. Three libraries reported having made modifications to the scheme.

In 1953, the librarian of the Royal Swedish Air Board reported his satisfaction with the SAIS:

> Among several available systems the SAI was chosen because of its simplicity. It is originally a distribution system, but as it is especially developed for aeronautics, it was considered convenient for our needs. It has been found to be very good from the circulation point of view as the reader can easily learn the numbers of the divisions which are of interest to him... The SAI system offers too few subdivisions however for some of the more common subjects as Aerodynamics and Structures...For many subjects the UDC system is much better, but unfortunately it is very difficult to use for Structural analysis and allied subjects.[1]

According to Shera:

> The Standard Aeronautical Indexing System was advanced as a monumental undertaking that would be a classification to end all classification, and in its fabrication a great variety of subject specialists were employed...As a classification its success can hardly be characterized as conspicuous, but it has

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1 Adler, Goran, Aeronautical indexing in Sweden. Cranfield, England, Association of Scientific Libraries, 1953. p.5-6. (ASLIB Aeronautical Group, Second annual conference, 1953, Preprint No. 1)

> survived as a system for dissemination of reports because of its effectiveness as an instrument for identifying fields of interest.[1]

Another opinion:

> About five years ago, when the SAIS was being developed by the Institute of the Aeronautical Sciences, we felt very strongly that it was being based on unsatisfactory principles, and would be of little use to the practising engineer...We were unable to persuade the Institute to change the SAIS...[2]

The major classes and the subclasses completed by an alphabetical index are to be found listed in "Standard aeronautical indexing system, division and section breakdown. New York, the Institute of the Aeronautical Sciences, 1949. 59p." The complete subject index to the classification, namely "Aeronautical subject headings, alphabetical arrangement SAIS, combined ATI, SAIS, SLA and others. New York, Institute of the Aeronautical Sciences, 1949. 8 vols, loose leaf." is an enormous publication that probably lists some 80,000 headings and their corresponding classification numbers. In the above reference ATI stands for "Air technical index" and SLA stands for "Special Libraries Association".

The hierarchy of this scheme has three ranks: 50 major classes are each divided into an average of approximately 10

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1 Shera, Jesse H. Classification: current functions and applications to the subject analysis of library materials. (In Tauber, Maurice F., ed. Subject Analysis of library materials. New York, Columbia University, c1953. p.35)

2 Niles, A.S. Extracts from a letter from. Cranfield, Association of Scientific Libraries, 1953. p.1. (ASLIB Aeronautical Group, Second annual conference, 1953. Preprint No.4)

subdivisions which, in their turn are given a few subdivisions. Here are a few of the 50 major classes and their corresponding numbers:

1. Guided missiles
2. Aerodynamics
3. Electronics
4. Power plants, rocket
5. Power Plants, jet and turbine
6. Power plants, reciprocating
7. Structures
8. Materials
9. Aircraft instruments
10. Airplane design and description
11. Propellers
12. Fuels and lubricants
13. Flight testing

Class No. 10 "Airplane design and description" is subdivided as follows:

0. General
1. Preliminary design
2. Wing group
3. Tail group
4. Body group
5. Landing gear
6. (not assigned)
7. Cockpit and control cabin
8. Control systems

As an example, "wings, delta" are given the number 10 2 1 which, as we can see from the breakdowns above stands for "Airplane design and description, wing group. This accounts for the "10" and the "2". As to the "1", it represents the third subdivision.

CCL classification system

This system, according to replies to the questionnaire is in use in three Dutch aeronautical libraries. In fact, it is used

in the five major aeronautical libraries in Holland. These libraries have classified catalogues. "CCL" stands for "Code voor Classificatie van Luchtvaart-literatuur" (code for classification of aeronautical literature).

Before the war, the libraries concerned used UDC. This proved unsatisfactory and the CCL scheme was devised as a joint endeavour of the five libraries. However, these libraries are now swinging back to UDC. In the words of the KLM librarian:

> Before the last world war the UDC was used for classification of aeronautical libraries, though there were not many of those in our country. The UDC did not prove sufficient to meet the requirements and an inventory was made of the subjects that should be included in the UDC.
>
> The arrangement of subjects was made systematically and because international contacts during the war were impossible we started to use this systematical index of aeronautical subjects as what you call a "locally developed scheme". After some years we came to the conclusion that such schemes ask even more work to keep them up to date than the work to that purpose on the UDC.
>
> At this very moment the aeronautical libraries in the Netherlands, of which there are 5 of importance, are switching over from "locally devised scheme" to UDC, because of less work for keeping up to date for the pure aeronautical headings and because of hardly any work on the related headings. [1]

The CCL classification uses both letters and numbers, as in "N 34", and combines symbols as in "B 57:B 877" or "N 34:N324:Q 750". The letters are used for the major divisions while the numbers are used for subdivisions. The major divisions and their corresponding letters are as follows:

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1 Letter to author dated September 24, 1958.

A General (including standardization, publicity, history)
B Mathematics, physics, chemistry
C Structural strength
D Aero and hydromechanics
E Flight mechanics
F Vibrations and acoustics
G Materials
H Workshop techniques
J Power units
K Aircraft construction
L Equipment
M Aeronautical instruments and measuring apparatus
N Civil aviation
P Military aviation
Q Meteorology, mechanical and civil engineering, electronics, aviation medicine
R Law, economics, insurance, personnel

The whole scheme was completed in 1948.

It might be of interest here to let the KLM librarian describe the documentation pool formed by aeronautical libraries using the CCL classification system in Holland.

> ...This pool was a logical result of the cooperation in making the classification scheme. The members of the classification committee had come to the conclusion that a lot of double work was done on documentation and that even then none of the five libraries had a complete documentation...
>
> The first work done was to make a survey of titles of periodicals, reports, etc., which are regularly received by all five parties. The titles were divided into five different surveys of titles, one for each cooperator.
>
> Each cooperator makes abstracts from the periodicals, etc. appearing on his specific survey, the titles of which are strongly related to his special field in aviation. On the side of KLM e.g. most of the abstracting is done on the field of air traffic, aircraft operation and maintenance.
>
> Cooperators send their abstracts to the pool (Nationaal Luchtvaart-laboratorium) daily. At the pool the abstracts are typed, duplicated, and the book-form indexes are sent to each party

in as many copies as wanted.[1]

The book-form format is a recent development. When the pool was started, cards were used. In 1956, Rom and De Kock indicated that this service had approximately 15 subscribers in addition to the five originators.[2] One of the ready-made cards is reproduced on page 58.

SDIT classification system

In reply to the questionnaire, three libraries (two French, one Italian) reported using the SDIT (Service de Documentation et d'Information Technique de l'Aéronautique, France) classification system. A survey made by Vessey reports that five other French firms use that system.[3] (Of those five, four being engine or propeller manufacturers were not queried; a fifth was queried and did not answer). In all cases the SDIT classification appears to be used with classified catalogues. A printed card published by the SDIT and bearing an SDIT classification number is reproduced on page 56.

The Service de Documentation et d'Information Technique de l'Aeronautique corresponds roughly to the library of the Royal Aircraft Establishment (England). Its classification has the following uses: it is used in the Service's own catalogues; it is

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1 Letter to author dated November 3, 1958

2 Rom, G.S. and de Kock, A.C. Aeronautical documentation in the Netherlands. (In Special Libraries, v.47, p.55, Feb. 1956)

3 Vessey, op. cit. tables at the end.

used for the arrangement and classification of entries in the organization's monthly index to aeronautical publications called "Bulletin mensuel signalétique"; [1] the classification numbers appear on the printed cards published by SDIT with its publications;[2] the classification is used, as we have seen, by some aeronautical libraries.

Libraries using this system have at their disposal the scheme "Classification scientifique et technique du SDIT" and an alphabetical index to it "Index alphabétique du SDIT".[3]

In fact the SDIT classification scheme is broader than the field of aeronautics and covers all the fields of interest of the organization. As will be seen here, "aeronautics" is only one of the five main divisions:[4]

1 Sciences
2 Industry
3 Aeronautics
4 Encyclopedias, Dictionaries
5 Miscellany

Further subdivisions use letters and figures alternatively:

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1 See p.152.

2 See p.56.

3 Bulletin mensuel signalétique, No. 162, Oct. 1958, p.3.

4 Letter to author dated April 24, 1958.

3 Aeronautics
3e Engines and propulsion units
3e4 Technique of engines
3e4d Reaction of engines
3e4d2 Ramjets
3e4d2c Ramjet combustion chambers

The translations from the French are the writer's own and do not purport to be absolutely precise. As mentioned before, the whole scheme has not been seen by the writer. However, entries in the monthly "Bulletin mensuel signaletique" are classified and arranged by that system. The numbers used in the October 1958 issue give an idea of the classification as a whole. Here are the subdivisions of "3 - Aeronautics" used in that issue:

3 Aeronautics
3a General
3b Aero and hydrodynamics
3c Aircraft
3e Engines
3f Equipment, furnishings and armament
3g Meteorology, biology, navigation, airports, communications, guidance of missiles

and here is part of the breakdown of "3b - Aero and hydrodynamics":

3b3 Aerodynamics of flying machines
3b4 Aerodynamics of the propeller
3b5 Aerodynamics of supporting surfaces
3b6 Hydrodynamics of the seaplane
3b7 Aerodynamics of various materials and parts
3b8 Wind tunnels and laboratories

If the publication examined is any indication, the aeronautical part of the SDIT classification is rather simple and contains but a few hundred subdivisions. The way in which the classification numbers are built up is reminiscent of the NACA classification system.

U.S. Bureau of Aeronautics' classification system

After the Standard aeronautical indexing system, this is probably the most detailed aeronautical classification system. It contains possibly over 35,000 subdivisions. Numbers range from 1 to 999 and are subdivided decimally. The number of decimals does not seem to exceed two.

This system was not intended for use by libraries other than that of the U.S. Bureau of Aeronautics; in fact, no other library reported using it. Although the alphabetical index to the system was given wide distribution in the U.S., the purpose of this distribution was to inform researchers of the subject on which the Bureau had publications. To quote from the preface of the alphabetical index:[1]

> The engineer or scientist who is interested in boundary layer measurements and who request the bibliography for subject classification number 124.21 will receive all the cards on this subject...After receiving the cards, the researcher will be able to request the particular reports which bear on his problem.

The classification scheme not being on hand, part of the subject index is quoted here to give an idea of the extremely detailed breakdown.

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1 Bureau of Aeronautics, Bibliographic Research Section. Subject classification of technical reports, supplement 1. Washington, 1955.

Here follows the subdivisions of the subject field "propeller blades" as found on B-4 of the subject index:

BLADES, Propeller 379.1
- Activity factors 373.1.8
- Aerodynamic characteristics 373.1
- Air discharge nozzles at tips 373.4.3
- Airfoils 373.1
- Angles 373.5.1
- Auxiliary blades for cooling 379.9.1
- Beaded trailing edges 373.1.5
- Coatings 541.9
- Deformation 373.1.3
- Engine exhaust-gas discharge at tips 373.4
- Extension, Trailing edge 373.1.1
- Factors, Activity 373.1.8
- Five-bladed propellers 373.5.6
- Hour-glass planform 373.1.6
- Loading 373.5.4
- Nozzles, Air discharge 373.4.3
- Number of blades, effects 373.5.2
- Paddle-bladed propellers 373.9.6
- Planform, Hour-glass 373.1.6
- Pressure distribution 373.1.2
- Radii 373.5.5
- Solidity effects 373.5.2
- Swept-back tips 373.1.4
- Thickness 373.5.9
- Trailing-edge extension 373.1.1
- Trailing edges, beaded 373.1.5
- Twist 373.5.3

U.S. Naval Academy classification scheme

In an article published in 1955, the Associate Librarian of the U.S. Naval Academy said that his library had "just completed and put into use a comprehensive and entirely new schedule for the classification of aeronautical-technological literature". The schedule is constructed to provide close and detailed classification in one sequence for all topics and sub-topics contained in the whole field of the aeronautical

arts and sciences." [1]

The general outline is as follows:

General Group

BB General works; Aeronautical education and training schools.

BC Airmanship; Flight techniques; Air navigation; Civil aviation law.

Engineering, Design and Powering Group

BD Aeronautical engineering, general; Applied aerodynamics; Aircraft design, structures and materials; Airport and airfield design and construction.

BK Aircraft power plants, auxiliary machinery and fuels; General flight propulsion.

Commercial and Industrial Group

BF Commercial and industrial aeronautics; manufactures, production and trade; Allied industries.

BG Airline and airport operation and management; Airways.

Military Group

BH Air forces of the world, organization, material, bases.

BJ Administration and maintenance of Air forces: personnel, supplies, communications.

BK Air warfare; Air strategy and tactics; Weapons; Aviation ordnance and gunnery.

These general classes are apparently subdivided decimally to a maximum of four figures.

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1 Saunders, James H. A new classification schedule for aeronautics. (In Journal of cataloguing and classification, V.11, p.9-12, Jan. 1955.)

3) LOCALLY DEVISED AERONAUTICAL CLASSIFICATION SCHEMES

It was indicated at the beginning of this chapter that 30 aeronautical libraries had devised their own classification schemes. Following a second query, five of these libraries were kind enough to send the writer some information on their scheme and an outline. These five schemes, which are probably typical of locally developed schemes will now be examined. Information and quotations are culled from answers to questionnaire, letters from librarians concerned and attachments to letters.

Boeing Airplane Co., Seattle (U.S.), classification scheme

This scheme is used in the Boeing library for the classification of reports. It contains approximately 225 subdivisions. The notation used in this system contains both letters and figures. Part of the scheme is given here as an example:

D3P - Propellers
D3PC - Propellers - Curtis
D3PH - Propellers, Hamilton
D3R - Rocket Propulsion
D3S - Superchargers
D3UC - P.P. - United Aircraft Corp.
D4D - Design Data
D4E - Electrical Equipment
D4EM - Electrical Motors
D4EP - Electrical - Power Plants (Auxiliary)
D4ES - Electrical Switches
D4G - Guided Missiles
D4P - Airplane Performance - Method of Computation - Flight Tests
D4W - Wind Tunnels and Tanks
05A - Catalogs - Airplane Parts and Materials
05B - Bearing and Bushings
05C - Catalog Miscellaneous - Automobiles - Trucks and Buses
05F - Factory Buildings and Organization
05G - Catalogs - Gears

A peculiarity of this system is that some of the publishing bodies are assigned classification numbers:

RIMP - NACA - Technical Reports

RIR - NACA - Technical Reports

RIRM - NACA - Research Memorandum

RITM - NACA - Technical Memo - NACA

RITN - NACA - Technical Notes

R2 - Navy

R2AR - Navy Aeronautical Reports

R2BO - Bureau of Ordnance Bulletins and Specifications

Apparently, when an originating body has been allotted a number, its publications are not subject classified. As an example, NACA Technical Note 3838 is given the classification number RITN which stands for the series "NACA Technical Notes". Boeing are not entirely satisfied with this scheme and are in the process of reorganizing their classification techniques.

Saunders - Roe Ltd (England), classification scheme

This scheme uses only letter (capitals and lower case). The main sections are:

A. HELICOPTERS, AUTOGYROS, GYROPLANES, VERTICAL RISING, COLEOPTERS.
B. AERODYNAMICS
C. AEROFOILS AND WINGS
D. AIRCRAFT
E. AIRSCREWS
F. CONTROL OF AIRCRAFT
G. STABILITY OF AIRCRAFT
H. SEAPLANES AND SHIPS
J. METHODS OF TESTING
K. AIR RESISTANCE

L. FLEXIBILITY
M. MATERIALS, PROCURES AND ACCESSORIES
N. CONSTRUCTION
O. STRENGTH OF STRUCTURES
P. LOADS ON STRUCTURES
Q. WEIGHTS
R. ATOMIC ENERGY
S. SYSTEMS AND INSTALLATION
T. ENGINES AND POWER INSTALLATION
U. EQUIPMENT, APPARATUS AND INSTRUMENTS
V. METEOROLOGY AND NAVIGATION
W. ARMAMENT AND WARFARE
X. SERVICES GENERAL
Y. BIBLIOGRAPHIES AND INDICES
Z. MISCELLANEOUS.

Each section is in turn subdivided. As an example, "B- Aerodynamics" is subdivided as follows:

B. AERODYNAMICS (Including Hydrodynamics and Thermodynamics)

(a) Fluid Motion - Theoretical
(b) Fluid Motion - Experimental
(c) Skin Friction
(d) Scale effect
(e) Boundary layer
(f) Compressibility effects
(g) Aerodynamic loads
(h) General

As an application of this classification, a NACA Report entitled "Investigation of the laminar aerodynamic heat transfer characteristics of a hemisphere cylinder in the Langley 11-inch hypersonic tunnel at Mach Number 6-8" is given the classification number "Ba" and"Br". This classification system is used for reports and books. The librarian reports that it works very well.

Princeton University, James Forrestal Research Center Library (U.S.), classification scheme

The interest of the Center ranging outside "Aeronautics", the classification scheme includes other fields of technology such as

"nuclear energy". The aeronautics part is divided in three broad areas:

9250 Aeronautics. General works.

9251 Aerodynamics.

9252 Aircraft designs. Aircraft loads and structures.

Each of these broad areas is subdivided. As an example, here follows part of the breakdown of "9251 - aerodynamics"

(9 2512) (Formerly used for: Airplane instruments)

9 2513 Aerodynamics of airplanes. Performance. Stability on control. Flight testing, etc.

9 2514 Transonic, supersonic and hypersonic aerodynamics, etc.

9 2515 Turbulance. Boundary layer, etc.

9 2517 Internal aerodynamics, etc.

9 2519 Wind tunnels. Laboratories, etc.

Hunting Aircraft Ltd (England), classification scheme

This scheme contains approximately 300 divisions, subdivisions and sub-subdivisions. The main divisions are:

A. Aerodynamics
B. Aircraft Engineering
C. Power Plants
D. Research Equipment and Technique
E. Materials
F. Meteorology
G. Aerodromes and Operators
H. Workshop Processing and Tooling
J. Administration

As examples of further divisions, "A-Aerodynamics" is divided as:

A1. Flow
A2. Geometry and Configurations
A3. Measurements, Effects and Results
A4. Thermodynamics
A5. Hydrodynamics
A6. Astronautics
A7. Aerodynamic Elasticity

Some of these divisions, such as "A1. Flow" are subdivided:

A1.1. Incompressible
A1.2. Compressible
A1.3. Viscous
A1.4. Rarefied Gases
A1.5. Aerodynamics of Heat
A1.6. Aerodynamic Theory
A1.7. Gas Dynamics

The librarian also writes that "Each of the smaller sections is further subdivided according to the scope of the subject". At the Hunting library, this classification is used for all publications except specifications and manufacturers catalogues.

Armstrong Whitworth Aircraft Ltd (England), classification scheme

This scheme contains 55 major headings and approximately 125 subheadings. Both letters and numerals are used, as in "26 C 2, Stability, dynamic, longitudinal (pitching)". The 55 major divisions are given numbers 1 to 55. Here follows a listing of some of these divisions:

1. Production method
2. Aerofoils and theory
3. Wing theory
4. Flaps
5. Air brakes
20. Structures (Detail stressing and design)
21. Structures (built-up)
22. Aerodynamic loading
24. Flutter
25. Aerodynamics
26. Stability
34. Compressibility
35. Low drag wings
37. Boundary layer control
38. Supersonic
39. Sweep

Many of these divisions are subdivided. As an example, "20. Structures (Detail stressing and design)" is subdivided into:

A. General stressing theories
B. Special stressing methods
C. Beams, columns, frames and rings. Torsion of solid structures.
D. Panels, plates and shells (compression)
E. Panels, plates and shells (shear)
F. Panels, plates and shells (pressure etc.)
G. Stress concentration, plasticity and fatigue.

The librarian is quite satisfied with this scheme. It is used for reports and periodical articles.

CHAPTER V

PROBLEMS IN SUBJECT ANALYSIS

Some of the problems inherent to aeronautical indexing are not always encountered in other subject fields.

1) THE PROBLEM OF THE LIBRARIAN VS THE SUBJECT SPECIALIST:

Lack of subject knowledge by the indexer may constitute a problem in an aeronautical library. Users of such libraries sometimes complain that the subject headings or classification number assigned do not always bring out the true subject matter of a publication. Indexing the highly specialized reports to be found in many aeronautical collections usually requires more subject knowledge than indexing broader publications such as books. To the indexer, it may seem far from obvious that such and such report contains important information on "air brakes" and should be indexed accordingly. As another example, some reports do not mention the type of aircraft dealt with. In that case, subject analysis will be more complete if the indexer has enough subject knowledge to recognize the airplane type from descriptions or diagrams.

Questions No. 51, 52, and 53 of the questionnaire were an

attempt to gather some information on who assigns subject headings and classification numbers in aeronautical libraries. The questions were as follows and librarians were invited to indicate a "yes" by a checkmark:

Are your subject headings and/or classification numbers assigned by:

Question No. 51: a librarian?

Question No. 52: a subject specialist who is not a librarian?

Question No. 53: a librarian who is also a subject specialist?

65 libraries answered "yes" to one or more of these three questions. Distribution was as follows:

Question No. 51 only	34	libraries
Question No. 52 only	16	..
Question No. 53 only	6	..
Questions No. 51 and 52	4	..
Questions No. 51 and 53	4	..
Questions No. 51,52 and 53	1	..
TOTAL	65	..

The reader is reminded that these figures are no more precise than the terms "librarian" and "subject specialist" themselves. As can be seen, the main assigner of subject headings and classification numbers in aeronautical libraries appears to be the librarian. However, the figures tend to show that the subject specialist is also playing an important role, either on his own or in collaboration with the librarian. It is also worthy of interest that in 11 libraries there

is such a person as "a librarian who is also a subject specialist".

To do their indexing work successfully, cataloguers who are not professional subject specialists must acquire as much knowledge as they can in their field and must make themselves familiar with the terminology. Experts must be consulted whenever there is doubt as to the real meaning of a word or the real subject matter of a publication. Except in a very small catalogue, subject headings recommended by a subject specialist who is not a librarian, cannot be accepted without careful monitoring by the librarian. These subject headings may have to be modified to make them follow established library methods, to make them follow the "local practice" of the particular catalogue or to make them agree with headings already in the catalogue. The same applied although more broadly to classification numbers. If a subject specialist is assigned to the library to help in subject analysis, the librarian must make sure that he is really a specialist. An engineer without specialization or long experience in aeronautics may be more of a liability than an asset for that particular purpose.

Whatever the proficiency of the cataloguer and the quality of the expert advice that he may be given, publications always have to be examined thoroughly before subject headings or classification numbers are assigned. Vessey, outlining a specification for an aerodynamic retrieval system describes aeronautical indexing as "a skilled occupation involving a study of the full text of the report".[1]

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[1] Vessey, H.F. Report on retrieval systems II. Paris, Advisory Group for Aeronautical Research and Development, Documentation Committee, 1955. (AGARD/DOC/6.4) p.16.

2) CHANGES AND TRENDS IN THE TERMINOLOGY:

Changes and new fashions in terminology have created a few difficulties for aeronautical librarians. As an example, "aerobatics" is now preferred to "acrobatic flying", "air intakes" to "air scoops", "delta" to "tailless airplane" or "flying wing", "fighter" to "pursuit" and "interceptor", etc. Such trends have to be detected by the librarian and reflected in the catalogue. This applies particularly to the catalogue that was started many years ago. With the development of applied science, librarians in most fields of technology have also encountered this problem. Here follows a particularly interesting example of fluctuation in missile designations:

> British names as complex as missiles. British missile code names originally were based on two words, the first a color describing the type of guidance system and the second a word assigned to the project. Typical examples were Fairey Fireflash which was Blue Sky and the de Havilland Firestreak which was Blue Jay. Bristol Bloodhound was Red Duster, English Electric Thunderbird was Red Shoes, Vickers infrared air-to-air type 888 missile was Red Dean. Other examples: Red Hawk and Blue Boar. Elaborate designation even included system for component coding but is believed to have broken down in practice and has been abandoned as designation system. [1]

3) CHANGES IN VALUE OF RELATIVE WORDS AND EXPRESSIONS:

Relative terms such as "fast", "high altitude", "high performance,

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1 British names as complex as missiles. (In Aviation Week, v.67, p.34, Sept. 30, 1957)

"high speed", "long range", "heavy" and "large", when applied to an airplane, do not have today the same meaning as they had twenty years ago or as they will have twenty years hence. Compared with the aircraft of ten or 20 years ago, "fast" is now much "faster", "heavy" is now much "heavier", etc. Even though such terms may be used quite freely by the users of a library, the librarian must be very wary of using them in the construction of subject headings. He must find a more objective way of describing the subject matter.

4) NEW WORDS AND EXPRESSIONS:

Entirely new expressions are born each year to designate new subject matter or subjects on which little work had been done before. Current examples of this are "heliport", "jet pod", "zero launch", "jet stream", "toss bombing", "hunter-killer". These expressions are often the result of the telescoping of a few words into one or two short ones. The librarian must note these expressions and, if necessary, use them in his catalogue, even if they do not appear in lists of subject headings or indexes to classification schemes. The vocabulary telescoping process mentioned above goes on continuously in a frantic search for more compact expressions. A "jet-engined airplane" or, as the British would call it, a "gas turbine engined aeroplane" is often referred to simply as a "jet". An "airplane propelled by jet engines that drive propellers" is now called simply a "turbo-prop airplane" or "propjet airplane" or in an even simpler fashion, a "turbo-prop" or a "propjet". Librarians would be the last to protest against a trend

towards simpler expressions and against the normal growth of language. Changes occurring during the "life-time" of a catalogue must be reflected in it. It is obvious that such changes will be made more easily in a classified catalogue than in an alphabetical catalogue. New words or expressions are sometimes poorly constructed as in the case of "ballistic missile", "ballistic" in Greek being roughly the same thing as "missile" in Latin. The terms "supersonic" and "hypersonic" might sound like synonyms to the literate. They are not. The second apparently means "as fast as five times the speed of sound or faster".

5) ABBREVIATIONS:

The layman lives in a world of abbreviations such as H-bomb, VJ-day, NATO, radar, TNT, GI, MIT, to such an extent that he may not realize that "radar" is an abbreviation or that such World War II expressions as "flak" and "stuka" were also abbreviations. [1] The aeronautical librarian also lives in a world inhabited by GCA (ground-controlled approach), VFR (visual flight rules), LORAN (long-range navigation), SONAR (sound navigation ranging), JATO (jet-assisted take-off), VTOL (vertical take-off and landing), STOL (short take-off and landing), etc. [1]

These abbreviations constitute no real problem in subject analysis.

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1 "Radar": radio detection and ranging; "flak": from the German "flieger abwehr kanone", meaning "anti-aircraft cannon"; "stuka": from the German "sturzkampfflugzeug", meaning "dive-bomber". These definitions and those of GCA, VFR, etc are from:
Heflin, Woodford A, ed. United States dictionary. Maxwell Air Force Base, Air University Press, 1956. 578p.

In some cases, the librarian may have to do some investigating to find out their meaning. In alphabetical catalogues, the abbreviated and the full form may have to be cross-indexed as soon as the abbreviation is used to a certain extent. In classified catalogues, it may be wise to incorporate both forms in the index. When an abbreviation becomes more commonly used than the full form, (as in radar) it may be more convenient, in an alphabetical catalogue, to use the abbreviated form and refer to it from the full form. Radar, sonar and vtol are examples of very popular abbreviations.

6) DIFFERENCES BETWEEN BRITISH AND AMERICAN TERMINOLOGY; TRENDS:

This is a source of vocabulary difficulties, especially for "in between" libraries such as those located in Canada. It is common knowledge that the "hood" of American cars is the "bonnet" of British cars and that the same applies to "gasoline" vs "petrol", "windshield" vs "windscreen", "trunk" vs "boot", "store" vs "shop", "druggist" vs "chemist", etc. Numerous differences of that kind also exist in the field of aeronautics: "airplanes" are "aeroplanes", "airfoils" are "aerofoils", "canopies" are "hoods", "stabilizers" are "tailplanes", "landing gears" are "undercarriages", "propellers" are "airscrews".

Sometimes the difference is more insidious in that it involves only the spelling (librarians all know about "catalog" and "catalogue") as in "tires" vs "tyres", "gages" vs "gauges" and "carburators" vs "carburettors". In the vocabulary of aeronautics, the trend seems to be towards the use of the American word, even in England, as we shall

see later. The problem of different spellings (tires-tyres), however, will probably always be with us.

If the cataloguer does not realise that a publication of the National Advisory Committee for Aeronautics on "stabilizers" is on the same broad subject as a Royal Aircraft Establishment publication on "tailplanes", havoc may result in the catalogue. The catalogue may be given entries under both headings without even the remedy of a cross-reference. This applies more to the alphabetical catalogue than to the classified catalogue.

That this problem of international English terminology does not involve only librarians, is obvious from the two following quotations. The reader will also note the strong plea for a more rational aeronautical vocabulary.

> One of my pet aversions is having two names for the same thing - like "tailplane" and "stabilizer", for example. We really must find some way of rationalizing aviation terminology; and even more important, we must make quite, quite certain that no new term is brought into common use unless it has been agreed among all English-speaking peoples.
>
> Even the recent field of missiles - sorry, I mean guided weapons - is giving rise to all manner of unnecessary complications. In America an anti-aircraft guided device is a surface-to-air missile - a self-explanatory term which fits in with air-to-air, unaware of anything called "surface"; it is the ground. Hence "ground-to-air weapon" (not missile). As for a British air-to-surface missile, that unhappy device relishes in the incredible designation of "stand-off bomb"...The trouble is, once a term has become accepted we use it every day without realising how crasy and ambiguous it may be. [1]

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1 Roger Bacon. Occasional column entitled Straight and level. (In Flight, v.73, p. 183, 7 Feb. 1958) Flight is one of the foremost British aviation magazines.

This same subject had been discussed before by the editor of the same magazine in the following words:

> As a race, engineers and technologists are certainly no less articulate than their fellows, and many have the great gift of being able to convey, in speech or writing, exactly what is in their mind. Even the latter, however, are unavoidably handicapped by the limitations of the aeronautical vocabulary.
>
> One of the classic examples of unnecessary difficulty of this kind is the distinction which has frequently been drawn between "airscrew" and "propeller"...Tractor propellers are still widely referred to as airscrews. We ourselves have subscribed to this practice for nearly half a century, but in this issue we depart from it, partly because the word (airscrew) is never used in America...but principally because there is no real reason for the existence of two separate words to describe the same object.
>
> One can cite many other examples of difficulties in the use of words, difficulties which could be cleared up overnight if there were an international authority competent to set a standard... Rationalization in aeronautics is frequently proposed as one of the panaceas to cure present ills. Where better to start, then, than in the vocabulary which we must use to convey our ideas? [1]

The underlining has been added by the writer of this thesis. This is quite important in that it formally expresses the abandoning of the British-preferred word "airscrew" by the authoritative British magazine "Flight". While, as we have seen, "Flight" adopted the term "propeller" in 1956, the famous British annual "Jane's all the world's aircraft" had adopted it as early as 1942. The British magazine "Aeroplane", however, has not given in yet.

While British aeronautical publications have gone through the agonies of indecision described above, something similar, although on

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1 Editorial entitled "Terminological Inexactitudes". (In Flight, v.70, p.663, 26 Oct. 1956)

a lesser scale, has been happening in the United States. How else explain the following?

Sears list of subject headings, 1954, gives:

Aeroplanes see Airplanes

Subject headings used in the dictionary catalogs of the Library of Congress, 1957, gives:

Airplanes see Aeroplanes

7) TERMINOLOGY PROBLEMS ENCOUNTERED BEYOND THE CATALOGUE:

Theoretically, all problems created in the subject catalogue of the aeronautical library by changes in terminology, abbreviations, synonyms, differences in spelling, etc., can be solved by the cataloguer via careful indexing. However, when a subject search extends beyond the library catalogue to reference works, commercially available indexes, catalogues of other libraries, these problems are met again and only the searcher's knowledge of language and subject will avail. As an example, cross-referencing between "tires" and "tyres" and between "stabilizers" and "tailplanes" may exist in a library catalogue. However, if a search for references on these subject is extended to printed indexes, the searcher will have to look for "tires" and "stabilizers" in the "Aeronautical engineering Index" and for "tyres" and "tailplanes" in "Index Aeronauticus". There are no cross-references in these indexes nor in most other aeronautical indexes to help the searcher in this regard.

CHAPTER VI

SUBJECT CATALOGUE - THE TYPE OF USER AND THE TYPE OF SEARCH

1) THE TYPE OF USER - LIBRARIAN OR READER?

Subject analysis in a subject catalogue will probably vary to a certain extent with the users of this catalogue. The catalogue intended for use mostly by the librarians will differ from that intended for use mostly by the readers alone or from that for use mostly by the readers with the help of the librarians. One would be inclined to assume that a catalogue is designed primarily for self-use by the customers of a library and secondarily for use by the librarians. However, a quick interview survey made in 1956-57 of eight aeronautical libraries in Montreal revealed that in four libraries out of eight, the catalogues were not self-explanatory to readers (or to a visiting librarian) and were not intended to be used without the help of the library staff. Furthermore in three of those libraries, the catalogues were intended for use only by the librarians. These catalogues were almost physically inaccessible to readers due to their location.

It seems rather obvious that in the libraries that build catalogues to be searched exclusively by librarians, the subject

analysis policies may be quite different from those in other libraries. In such catalogues, there will be eventually less cross-referencing and there will be little incentive to keep terminology absolutely up-to-date. In a word, such a catalogue will not have to be "obvious". The same applies to libraries where a specialist is interposed as an interpreter between the catalogue and the reader. There is a danger to the building of a catalogue "by the librarian for the librarian" in that, with the growth of a library following that policy, the catalogue may eventually have to be turned over to the readers for self-use. In such a case, drastic modifications may have to be made to the catalogue or retrieval by the readers may be incomplete.

In the writer's questionnaire, three questions were aimed at determining who were the major users of the subject catalogue in aeronautical libraries:

Question No. 13 "Is your subject catalogue used mostly by the librarians?"

Question No. 14 "Is your subject catalogue used mostly by readers without the help of librarians?"

Question No. 15 "Is your subject catalogue used mostly by readers with the help of librarians?"

Of 74 librarians that answered these questions, 22 disregarded the word "mostly" and checked more than one of the three questions. The affirmative answers were as follows:

Question No. 13 (group A)..... 21 libraries

Question No. 14 (group B)..... 5 ..

Question No. 15 (group C)..... 26 ..

Checked more than one (group D)..... 22 ..

In these 74 libraries, the major group is that made up of groups C (26 libraries) and D (22 libraries) where librarians and users either collaborate in the use of the catalogue. This total group comprises 48 of the 74 reporting libraries.

Group A where the subject catalogue is used mostly by the librarians is fairly important (21 libraries) and is much larger than group B where the catalogue is used mostly by readers alone (5 libraries). Group A is of special interest in the light of the discussion at the beginning of this chapter. Further analysing this group of 21 libraries, we find that it consists of nine North American and 12 overseas libraries, while the total group of 74 reporting libraries consists of 38 North American and 36 overseas libraries. This might indicate that catalogues used mostly by librarians may be somewhat more popular overseas.

Group B, where the catalogue is used mostly by readers without the help of librarians, is surprisingly small (five libraries). This small proportion might imply that the majority of aeronautical librarians are not interested in designing "self-service" subject catalogues.

2) THE TYPE OF SEARCH - QUICK REFERENCE OR LENGTHY SEARCH?

In an effort to determine whether the subject catalogues of aeronautical libraries were used for quick reference or for lengthy searches, the writer included the following questions:

Question No. 16 "Is your subject catalogue used mostly for quick ref.?"

Question No. 17 "Is your subject catalogue used mostly for lengthy searches?".

Answers were as follows:

Question No. 16 (...for quick reference).....24 libraries

Question No. 17 (...for lengthy searches)..... 6 ..

Answered "yes" by checking both questions.....39 ..

From the above figures, the following conclusions could be drawn: a. By a slight majority (39 to 30) aeronautical libraries use their catalogues for both quick reference and lengthy searches. b. More catalogues are used mostly for quick reference than are used mostly for lengthy searches.

The majority of the 24 libraries where the catalogue is used mostly for quick reference have alphabetical catalogues, while the majority of the six libraries where the catalogue is used mostly for lengthy searches have classified catalogues. The breakdown of the 24 libraries where the catalogue is used mostly for quick reference is:

Alphabetical catalogues.....13 libraries

Classified catalogues..... 7 ..

Both types..... 2 ..

Punched cards..... 1 library

Undetermined..... 1 ..

The breakdown of the six libraries where the catalogue is used mostly for lengthy searches is:

Classified catalogues..... 4 libraries

Alphabetical catalogues..... 2 ..

Although one should be wary of drawing conclusions from such small samplings, this tends to confirm the writer's theory that the classified catalogue, being more cumbersome of access and bringing related subjects together, would be more suited to the lengthy search. For a discussion of the classified vs the dictionary catalogue, the reader is referred to the next chapter where survey figures quoted show that the classified catalogue is more popular in aeronautical libraries overseas than in North America. A conclusion could be drawn to the effect that libraries in North America are better equipped for quick reference while those overseas are better equipped for lengthy searches.

CHAPTER VII

CLASSIFIED VS ALPHABETICAL CATALOGUES

It is a well established fact that classified catalogues are popular in Europe while alphabetical catalogues are popular in America.[1] Two questions were included in the survey to investigate this point and determine whether aeronautical libraries followed this pattern or not.

Question No. 9 "Is this subject catalogue completely alphabetical?"

Question No. 10 "Is this subject catalogue a classified (classed) catalogue?"

The answers were as would be expected:

Question No. 9 (alphabetical) In 40 libraries (35 in America, 5 in Europe)

Question No. 10 (classified) In 37 libraries (6 in America, 31 in Europe)

These figures must be used only as a broad indication. The terms "alphabetical" and "classified" seem to have been confusing for some librarians. As a result, the compiler has had to interpret some answers and reject others. Some librarians did not answer these questions.

The heavy use of the classified catalogue in Europe and of

---

1 Taylor, Kanardy L. Subject catalogs vs classified catalogs. (In Tauber, Maurice F. ed. The subject analysis of library materials. New York, Columbia University, c1953. p.100-113)

the alphabetical catalogue in America would seem to indicate that aeronautical librarians, in their choice of a type of catalogue, are guided to a certain extent by local tradition and fashion. The following remarks of an aeronautical librarian throw some light on the historical background of this situation:

> On the European continent the conglomerate of nations living closely together, under thoroughly different circumstances and with thoroughly different development of languages, gives rise to the necessity, when having to cooperate in the field of classification, of a classification index which bridges the semantical problems...The classification necessary for literature documentation was developed mainly within the scope of special libraries by technically or scientifically trained people, each within their own field of interest for which the UDC meant a useful tool and mutual connection.
>
> In North America... the development of subject catalogue systems has been in the hand of public libraries mainly, or, in special libraries, by people trained in public library practice or at library schools, while the influence of the Library of Congress was large. As a consequence of this development a systematical index was used at most for the shelf-organization of the library and retrieval purposes were served by an alphabetical index. The thoroughly different organization of a special library and a public library, as is evident in Europe, seems to be non-existent in North America.
>
> In England, the situation is somewhat in-between these extremes. The language problem is not so important as on the European continent. The difference between public library and special library organization seems to be more European.
>
> The enthusiasm for the Uniterm System of Coordinate Indexing in the American Countries seems to be mainly due to this general use of an Alphabetical index with all its difficulties and tricks.
>
> ...In Europe the tendency is more towards a decimal classification which reduced the semantical problem, for which the UDC offers a comprehensive system in which are present all fringe fields, developed by their own specialists.
>
> ...The problem of classification appears to be closely tied to the semantics problem on the one side (of the Atlantic) and to the personal problem on the other side. 1

---

1 Rom, Gertrude Scherpenhuijsen, . Report on subject classification systems. Paris, Advisory Group for Aeronautical Research and Development, 1954. (AGARD/Doc/5.1) p.1.

The dictionary catalogue is more practical for quick reference, while the classified catalogue is more practical for lengthy searches. Survey figures given in the preceeding chapter bear this out. The alphabetical catalogue is practical for direct and immediate access to a well defined subject. Related subjects may be scattered throughout the catalogue. This is quick but limited. The classified catalogue is more cumbersome of access due to the need of searching through a key to locate the numbers corresponding to the subject of interest. Once the reader turns to that section, however, he finds together entries corresponding not only to the immediate subject of interest, but also to fringe and related subjects. This is slower, perhaps, than using an alphabetical catalogue, but it is very thorough.

The alphabetical catalogue, however, does not have to scatter related subjects throughout the catalogue. Some librarians give it a classified slant through a maximum use of inverted subject headings. As an example, the following scattered headings

Axial flow fans
Centrifugal fans
Electric fans
Wind tunnel fans

can be brought together under "fans".

Fans, axial flow
Fans, centrifugal
Fans, electric
Fans, wind tunnel

In fact, this second arrangement is that recommended in Special Libraries Association's "Subject headings for aeronautical engineering libraries".

The alphabetico-classed catalogue is an extreme example of this philosophy. The survey has shown that inverted subject headings are as popular as direct subject headings in the alphabetical catalogues of aeronautical libraries.

The classified catalogue can transcend language barriers to a certain extent. The UDC number 629.13.014.3 does not only designate "wings" but also "aile" to a French reader, "ala" to a Spanish reader and "tragflache" to a German reader. This is an ability that the alphabetical catalogue does not have. An alphabetical catalogue would have to be translated completely, like an ordinary book, to be usable in another language. In theory, only the "key" to a classified catalogue would have to be multilingual.

Be this as it may, some famous librarians, whose thinking runs along international lines are deeply concerned with the lack of multilingual features of the alphabetical catalogue. In the forceful words of Herbert Coblans, Head of the Scientific Information Service of the European Organisation for Nuclear Research:

> (In)subject catalogues...two methods stand starkly opposed to each other - alphabetical subject headings versus classified arrangement. The former is much commoner. In the United States of America and other areas where American library methods are used, the classified catalogue is almost unknown. Lists of subject headings, when standardised for one language, are feasible within countries sharing a common language, though their disadvantages have been repeatedly stressed in works on library organization. Their naive translation into other languages has produced some misleading and almost frightening results in some countries. For international collaboration the alphabetical catalogue is thus unsuitable. In special libraries where the users think naturally in classification terms, there is much to recommend the classified catalogue. It must of course be used in conjunction with an alphabetical index, not of standard subject headings, but of all the possible subject phrases and their

> corresponding classification numbers. For an international library, as many indexes can be provided as there are official languages in the organization. Even for monolingual institutions in countries where the national language is not a world language, the classified catalogue has an advantage from this point of view. Very often in such cases English or French subject catalogues are used, as the specialised terms have not been standardized in the local language. With a classified catalogue, the alphabetical subject in English, or any other common language, can be run alongside one in the national language and it can be gradually added to and developed. This is at the same time a contribution to the building u of local terminology, so necessary in some less developed areas. [1]

With a milder tone than Coblans', Tauber makes the following recommendation to American librarians:

> The indication that the alphabetical catalog is easier to use because it allows the general user to draw on his familiarity with it is not necessarily a reason why librarians should not study the classified catalog carefully as a possibility for revealing the contents of research libraries, especially scientific libraries. [2]

Libraries having both an alphabetical catalogue and a classified catalogue are in a good position to find out the readers' reactions to each type. This is the case in the numerous libraries that have an alphabetical catalogue for the bulk of their collection and a separate classified catalogue for the publications of the National Advisory Committee for Aeronautics. [3] Such is the situation in the library of Canadair Ltd in Montreal. Canvassing of a few Canadian and

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1 Coblans, Herbert. Some notes on the organization of special libraries. (In Unesco bulletin for libraries, V.12, p.261-266, Nov-Dec. 1958)

2 Tauber, Maurice F. The subject analysis of library materials. New York, Columbia University, c1953. p.5.

3 See p.43.

English users at Canadair has revealed the following: Canadian engineers generally prefer the alphabetical catalogue and would like both catalogues to be merged into a single alphabetical catalogue. Some (but not all) English users prefer the classified catalogue (they used them back in England) and would like both catalogues to be merged into a single classified catalogue.

Library users familiar with classified catalogues seem to have little difficulty using a dictionary catalogue. The reverse is not true. some Canadian users at Canadair never seem to have become really at ease using the classified catalogue.

Librarians using an alphabetical catalogue are usually satisfied with a broad classification scheme that they use only for their books. They are very concerned with subject headings and are forever in search of better lists of subject headings in their subject field. On the other hand, librarians using a classified catalogue are not too concerned with subject headings. However, they must adopt the right classification scheme from the beginning and they are always eagerly awaiting expansions and refinements of that scheme in their field. If nobody does it for them, some librarians maintaining alphabetical catalogues may become deeply involved in creating subject headings, while some librarians maintaining classified catalogues may become deeply involved in expanding their classifications.

Although there is a large literature on the subject of the classified vs the alphabetical catalogue, very little experimental work has been done to compare their cost and efficiency, especially for aeronautical libraries. However, a controlled experiment has been set

up at the College of Aeronautics, in England, whereby 18,000 aeronautical documents will be indexed according to the four following methods: the Universal Decimal Classification; alphabetical subject headings; a special faceted classification; a co-ordinate indexing system based on Uniterm. The results of the test will give comparative information on such aspects as: time cost of preparing the index; time cost of using the index; cost of equipment; thoroughness of retrieval and relevancy of references retrieved. [1]

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1 Cleverdon, Cyril. An investigation into the comparative efficiency of information retrieval systems. (In Unesco bulletin for libraries, v.12, p.267-270, Nov.-Dec. 1958)

CHAPTER VIII

ABSTRACTS AND ABSTRACTING SERVICES

Abstracts on catalogue cards, in indexes and in periodicals are universally liked by users of aeronautical libraries. They save time by giving readers a very precise idea of what a publication is about. The Armed Services Technical Information Agency (U.S.), state the purpose of abstracts on their printed cards in the following words:

> Since most of our catalog cards carry abstracts, our bibliographers and reference people can scan through them for even finer points, once the catalog has been entered alphabetically under a given subject heading. The abstracts also have a way of suggesting further likely headings so that every search follows a kind of evolutionary process.[1]

Vessey goes even further in stressing the importance of abstracts. Outlining a specification for an aerodynamic retrieval system, he says that "retrieval is understood to be the display of a full abstract of the document required". [2]

1) ABSTRACTS ON PRINTED CARDS:

Many series of printed cards contain abstracts and are

---

1 Vessey, H.F. Report on retrieval systems II. Paris, Advisory Group for Aeronautical Research and Development, Documentation Committee, 1955. (AGARD/DOC/6.4) p.4

2 Vessey, op. cit. p.16.

powerful tools in the propagation of the idea of abstracts on catalogue cards. The abstracts on printed cards are never evaluative and never contain criticism. Reports in the field of aeronautics usually deal with experiments. The abstracts of such reports usually summarize the problem, the steps taken to solve it and the result.

Vessey describes indexing as "a skilled occupation involving a study of the full text of the report". [1] There is no reason not to apply this excellent definition to the art of abstracting. This conflicts, however, with the science of "mechanical abstracting" whereby an abstract is made up blindly as a sequence of the words that recur most frequently in the preface or first pages of a publication.

Printed cards containing abstracts are received with the publications of the National Advisory Committee for Aeronautics (U.S.), the Royal Aircraft Establishment (England) and many other report publishing organisations. As a matter of fact, most organizations publishing printed cards with their documents have started including abstracts on these cards during the last few years. Many samples of printed cards carrying abstracts are shown in Chapter II. Commenting on the format and quality of abstracts found on the printed

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1 Vessey, op. cit. p.16.

cards of the major organizations, Kennedy said:

> ...All cards examined carry abstracts, which, with one exception, when carried to the back of the card, have been inverted... Although the adequacy of the abstracts has not been evaluated, this most fundamental element of the card appears to have been well done in all cases. 1

2) ABSTRACTING DONE BY LIBRARIANS:

Abstracts are sometimes made by librarians for inclusion in accession lists or other publications. These will not be discussed here. Question No. 54 asked: "Do you type abstracts, reviews or lists of contents on your subject cards?" One would be inclined to think that aeronautical librarians are normally too busy to make abstracts for their catalogues or even to list contents. However, of 77 libraries that gave usable answers, 28 answered affirmatively to that question. Of these libraries 10 are in North American and 18 overseas. Considering that the answering libraries were made up of 36 American and 41 overseas libraries, one might say that this practice might be somewhat more popular overseas than in America.

3) ABSTRACTS IN VARIOUS INDEXES AND PERIODICALS:

Abstracts are also to be found in some of the indexes to aeronautical publications such as "Index aeronauticus" and the

---

1 Kennedy, R.A. Catalogue cards issued with research reports. Paris, Advisory Group for Aeronautical Research and Development, 1954. (AGARD/DOC/4.2) p.13.

"Aeronautical engineering index". Some aviation magazines ("Aero/space engineering" is the outstanding example) carry abstracts. Some of the general indexes such as the "Engineering index" list and abstract articles in many fields related to aeronautics. In the words of Thorne:

> The following Journals include abstracts on aeronautical and allied subjects.
> Aerodrome Abstracts; issued by Road Research Laboratory, D.S.I.R.
> Aeronautical Engineering Review; issued by Inst. of the Aeronautical Sciences and cumulated annually in Aeronautical Engineering Index.
> Airplane Patent Digest; issued by Manufacturers Aircraft Assoc. Inc. N.Y.
> Bristol Engine Division Technical Abstracts.
> Index Aeronauticus...
> Inter Avia...
> List of Research and Development Documents; issued by T.P.A.3/T.I.B.
> Rolls Royce Technical Abstracts and Information
> Rotol Digest
> Royal Aeronautical Society. Notices and Reviews.
>
> There are more and of course a large number of organisations in associated fields publish abstracting journals of interest to workers in aeronautics.1

Observing scientists of the James Forrestal Research Center (Princeton University), Smith throws some light on both their information gathering habits and their use of abstracts; what is more, aeronautical engineers are involved:

> One chemist, two electronic engineers and eight aeronautical engineers felt that the location of one or more reliable recent journal papers or reports was the most frequent method of finding information. Six aeronautical engineers mentioned use of NACA Research Abstracts (U.S. National Advisory Committee for Aeronautics)and five used also that organisation's Index of NACA Technical Publications. Two mentioned Applied Mechanics Review, one mentioned Mathematical Reviews and one who used both of these mentioned the usefulness of International Aeronautical Abstracts published since January 1956 in the Aeronautical

1 Thorne, R.G. The documentation of information in the aeronautical and allied fields. Farnborough, Royal Aircraft Establishment, 1951. (RAE Library Memorandum No. 3) p.2.

Engineering Review...One engineer who uses the Bulletin Signalétique felt that none of other sources he consulted could match its coverage...One aeronautical engineer felt that abstract journals were too time consuming. He maintains an extensive card file, and spoke of the usefulness of the Germain perforated card service issued previous to World War II by the Zentrale fur Wissenschaftliches Berichtswesen uber Luftfahrtforschung (ZWB).[1]

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1 Smith, Maurice H. An evaluation of abstracting journals and indexes. (International Conference on Scientific Information, Washington, 1958. Preprints of papers. Washington, NationalAcademy of Sciences and National Research Council, 1958. Area 2, p.7)

CHAPTER IX

INDEXES TO PUBLICATIONS

This chapter will deal with printed indexes to aeronautical publications. These indexes are in book form and appear at regular intervals. Some can be purchased, others can be obtained free of charge. Questions No. 43-49 investigated the receipt and use of the following indexes:

Aeronautical engineering index

Index aeronauticus

Index of NACA technical publications

Air University periodical index

Pacific Aeronautical Library. Uniterm index to periodicals

SDIT. Bulletin mensuel signaletique

Other indexes specialized in aeronautics

In each case, librarians were asked to indicate if the index was received, if it was used mostly by librarians or if it was used mostly by readers.

Some librarians who receive some of these indexes checked both "used mostly by librarians" and "used mostly by readers" or checked neither. Those that checked neither will be ignored in the last three columns of the table given on the next page. As one would expect, the country of origin of an index will influence its

area of use to a certain extent. A broad geographical distribution of use is also reflected in the table. Of 77 libraries that answered the questionnaire only six indicated receiving no indexes at all. This is an indication of their popularity.

	received	received in U.S. and Canada	received overseas	used mostly by librarians	used mostly by readers	used by both readers and librarians
Aeronautical Engin. Index. (U.S.)	59	33	26	36	9	8
Index Aeronauticus (England)	48	15	33	25	13	6
Index of NACA Technical Publications (U.S.)	66	34	32	24	22	14
Air University Period. Index (U.S.)	28	28	0	19	2	4
Pacific Aeron. Library Uniterm Ind. (U.S.)	15	11	4	7	5	2
SDIT. Bulletin Mensuel Signaletique (France)	15	5	10	8	4	0
TOTAL	231	126	105			

Conclusions could be drawn from this table, the major being:

a) A given index is most popular in its geographical area of origin. As an example, "Aeronautical engineering index" is more popular in North America than overseas.

b) Indexes are used more by librarians than by readers.

c) More indexes are probably received per library in the North

American libraries than in those overseas. We note that we arrive at a total of 126 index titles in North American libraries and 105 in overseas libraries, even though more (41) overseas libraries than North American libraries (36) replied to the questionnaire. This probably has something to do with the fact that only two of these indexes are published overseas.

d) "Aeronautical engineering index", "Index aeronauticus" and "Index of NACA technical publications" are more popular than the others.

Question No. 49 "(Indicate) other indexas specialized in aeronautics", netted only references to various unspecialized indexes.

The six most important indexes in the field of aeronautics, (as revealed by the survey) will now be discussed individually.

Aeronautical engineering index

The table given at the beginning of this chapter shows that this index is one of the most widely used. Slightly less use is made of it overseas than in North America. It is used much more by librarians than by readers.

This is a one-volume annual publication. Until 1958, ten volumes had been published. It is a cumulation of all the abstracts published each month in the magazine "Aero/space engineering" (formerly "Aeronautical engineering review") during a given year. The following

notes are based on an examination of the 1956 volume published in 1958.

The purpose of this index, as stated on p.3 of the preface is:

> To provide a useful and convenient reference tool for engineers and aeronautical scientists in locating reports, periodical articles, meeting papers, books and other publications in their particular field of interest.[1]

This index covers a wide variety of types of publications and, unlike some other indexes, is not limited to periodical articles. Approximately 280 periodicals and 135 series of technical reports are screened in the preparation of this index. Many are in allied fields such as electronics, mathematics, fuels, etc. As its name implies, this index is selective in its choice of items for indexing. When indexing magazines of rather general interest it will pick out only those articles of particular interest to engineers. Although foreign publications are included, the majority of publications indexed are American and in the English language.

Approximately 50 major subject headings are used, with subdivisions and sometimes sub-subdivisions. The manner in which "Instruments" is subdivided can serve as an illustration:[2]

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1 Aeronautical engineering index. New York, Institute of the Aeronautical Sciences, 1956. Preface, p.3.

2 Ibid., Preface, p.8.

Instruments
- Accelerometers
- Automatic control
  - Servomechanisms
- Engine instruments
- Flight instruments
- Flow measuring devices
- Gyroscopes
- Pressure measuring devices
- Recording equipment
- Stress and strain measuring devices
- Tachometers
- Temperature measuring devices
- Vibration measuring devices

The 1956 edition contains a classified subject index of which the above example is a part, as well as a true subject index (of all the divisions and subdivisions used) and an author index. Abstracts are given for most publications listed. Sometimes, especially in the case of books, the abstracts are lengthy. This is apparent from the half-page reproduced as figure 20.

In this example, "Aerodynamics" is the main heading, while "Porous media" and "rotating flow" are secondary subdivisions of the subdivision "Fluid mechanics and aerodynamic theory" which does not appear on this page. Note the lengthy book reviews and the inclusion of foreign publications. This index is relatively easy to use and, being alphabetical with a strong hierarchical slant, allows for browsing. It is commercially available.

Index aeronauticus

Data given at the beginning of this chapter shows that this

AERODYNAMICS

POROUS MEDIA

Flow of Gases Through Porous Media. P. C. Carman. London, Butterworths Scientific Publications; New York, Academic Press Inc., 1956. 183 pp., diagrs., tables. $6.00.

This text provides an integrated and quantitative account of the flow processes involved when gases flow into or through fine-pored media. It presents a connected account of the current knowledge on the subject, both theoretical and practical, rather than indulging in specific technical applications. The subject is approached from the viewpoint of the Kozeny theory; its limitations are fully discussed for consolidated media for high porosities and for relative permeability, with particular attention to the question of pore size distribution. It is extended to cover the transition to Knudsen flow, and, in the last chapter, the transition from viscous to turbulent flow. Its application to the permeability method for measurement of surface of powders is fully described. In addition, recent work on surface diffusion and capillary flow of adsorbable gases in fine-pored systems is reviewed. A chapter on the use of porous media for gas separations includes a discussion of gas chromatography. The appendixes include an author index, a subject index, and a table of symbols used in the text. The author is Chief Research Officer, National Chemical Research Laboratory, South African C.S.I.R.

Unsteady Radial Flow of Gas Through Porous Media—Variable Viscosity and Compressibility. J. S. Aronofsky and J. D. Porter. (*ASME Diamond Jubilee Annual Meeting, Chicago, Nov. 13–18, 1955.*) *J. Appl. Mech.*, Mar., 1956, pp. 128–132. Calculation of pressure-time histories and flow rates presented for radial unsteady flow of gases through porous media, with gas viscosity and gas compressibility expressed as simple functions of pressure. Results obtained on the M.I.T.

Contribution à l'Étude des Milieux Poreux. I—Introduction. II—Écoulement Plan. III—Méthode de Relaxation et Écoulement de Révolution. Mladen M. Boreli. *France, Min. de l'Air PST 305*, 1955. 129 pp. In French. Theoretical and experimental investigation of the problems of underground flow governed by gravity laws based on the Darcy findings.

Further Investigation of Laminar Flow in Channels with Porous Walls. S. W. Yuan. *J. Appl. Phys.*, Mar., 1956, pp. 267–269. Extension of the problem of two-dimensional steady-state laminar flow to the case of moderate-to-high suction or injection velocity at the walls. Includes calculation of an exact solution of the Navier-Stokes equations reduced to a third-order nonlinear differential equation with appropriate boundary conditions; and velocity components, pressure, and coefficient of wall friction expressed as functions of the velocity through the porous wall, the average axial velocity of the Poiseuille flow, the coordinates and dimensions of the channel, and the physical properties of the fluid.

ROTATING FLOW

On Supersonic Rotational Flow Behind Strong Shock Waves. I—Flow Past Airfoils. Abraham Kogan. *Technion Res. Devel. Found., Haifa, TN (AFOSR TN-56-165)*, 1956. 58 pp. 17 refs. Development of a method of successive approxima-

An Experimental St mensional Refraction Wave at a Contact Su ton. *J. Aero. Sci.*, N 1,006. 12 refs.

Interaction of Gri Shock Waves. Darsh *U.S., NACA TN 368* pp. 27 refs. Theoreti tal investigation based recorded by means of hot-wire techniques, growth, and speeds of t reflected shock fronts incident wave splits af grid mounted in the shock waves in a shock

Influence d'une R Capté sur la Résistar Entrée d'Air Supersoni J. Nicolas. *La Rech* July-Aug., 1956, pp. Analysis of a detache erated at the supersoni the resulting modificat namic resistance.

Analytical Treatmen sional Supersonic Flow Flow. II—Flow with W Mahony and R. E. Mey *Royal Soc. (London)*, 1956, pp. 467–515. 2 ment of approximation the general wave-inter steady, irrotational, hon perfect gas.

Analytical Treatmen sional Supersonic Flow Weak Shocks. J. J. M *ARL Rep. A 94* Apr. 1

Figure 20. Aeronautical Engineering index. Reproduction of part of p.19, 1956.

index [1] is one of the most widely used. Far more use is made of it overseas than in North America. It is used much more by librarians than by readers.

This is a monthly publication completed by a yearly index and an occasional "list of journals reviewed". The following notes are based on the July 1958 issue, on the yearly index for 1957 and on a "list of journals reviewed" dated June 1957. Its purpose, as stated in the introduction of the July 1958 issue, page 2, is:

> ...to draw attention to articles of value in the technical press in connection with aeronautical research development, production, and operations. Translations considered to be of value to aeronautics are listed...

This index covers over 300 periodicals and series of technical reports. It is selective, but is not restricted to engineering. Although more American and British publications are indexed than those of other nations, the outlook is truly international, publications of Sweden, Holland, France, Japan, Germany and many other countries constituting a large percentage of the entries.

Examining the July 1958 issue, we find a table of contents organized in alphabetical order of subjects and giving pages where publications on these subjects are to be found. There are approximately 35 such headings, of which these are the first ones:

---

1 Index aeronauticus, a review of technical information. London, Ministry of Supply. Monthly.

Acoustics, Vibrations
Adhesives
Aerodynamics
Air Bases
Aircraft (see also "Military Engineering")
Aircraft Components
Aircraft Instruments
Air Transport
Astronautics
Aviation Medicine

In the body of the index, however, the entries are organized in numerical order of UDC numbers. The above subject headings are retained, but they no longer are in alphabetical order. This is illustrated in the half-page reproduced as figure 21. The numbers in the upper left corners of entries are item numbers. Abstracts are given for all items. They range from a few words to a dozen lines. An author index and a list of translations are appended.

The yearly index is quite different from the monthly index that we have examined until now. It contains only subject headings and item numbers that refer to the monthly editions. However, the subject breakdown is much finer than in the monthly issues. As an example, in the 1957 issue, the heading "aerodynamics" is now subdivided into hundreds of subdivisions.

Compared to the majority of the indexes studied in this chapter, "Index aeronauticus" is more up-to-date but more cumbersome to use. It is more up-to-date due to its "up-to-the-month" issues; it is more cumbersome because in searches involving any long period of time such as a year or a few years, a great many monthly issues have to be used. "Index aeronauticus" comes free of charge.

MILITARY ENGINEERING

191/14/7 623.746.3

Night All-Weather Pursuit and Light Combat Aircraft Yakovlev Yak-25 Flashlight

Flugwelt 10(4),255-258 April,1958 Germany

This multi-purpose aircraft is similar to the French SO 4050 Vautour. The weight is from 16,000 to 20,600 kg. according to Mark number and thrust from 7,200 kp to 8,900 kp. The engines are Type PA-10, 10-stage axial turbines. Possibly two of the three types of this aircraft have bigger engines than this. Maximum speed is about 1,200 km/hr., cruising speed about 1,000 km/hr., ceiling 16,000 m. and range 2,400-3,000 km. The Flashlight carries rocket armament, probably unguided in the current versions.

192/14/7 623.746.4

Valiant - First of the V-Bombers

Aeroplane 94(2437),688-693 16.5.1958 U.K.

This account of development of the Vickers Valiant includes a double page cut-away drawing of the Valiant B.K. Mark 1.

STRENGTH OF STRUCTURES

193/14/7 624.07 :512.831

A Simple Method of Matrix Structural ... J.aero Sci

Figure21. Index aeronauticus. Reproduction of part of p.76, July 1958.

Air University periodical index

This is a quarterly index.[1] The quarterly issues are completed by yearly cumulative issues. There has also been a three-year cumulation (1953-1955). The following notes are based on an examination of the April-June 1958 issue, the cumulative issue for 1957 and the cumulative issue for 1953-1955. Its policy, as stated on page 4 of the preface of the April-June 1958 issue is:

> ...serves primarily the educational and research program of the Air University. It attempts to index the English language military and aeronautical periodicals of more than local interest which are not indexed in any other indexing service. In a few cases, however, the AUPI does index periodicals indexed elsewhere, when in the opinion of its editors, there is too much delay in making such indexing available, when the indexing is done by services not readily available in many libraries or when it is believed that there is some other justification for such duplication of effort.

This index deals with approximately 70 magazines. Although this is far fewer titles than are covered by other indexes (such as "Index aeronauticus") this index deals with many that are not covered elsewhere. These are generally U.S. Armed Forces periodicals such as "Combat crew" or house organs such as the "Boeing magazine". Both technical and non-technical magazines are indexed. The majority are American.

Examining the April-June 1958 issue, we find that it is organised as a continuous interfiled alphabetical sequence of subjects and authors. However, not all authors are given entries. Apparently,

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1 Air University periodical index. Maxwell Air Force Base, Alabama, Air University Library. Quarterly.

this index makes author entries only for those writers that it judges important by its own standards. Subject headings are sometimes direct, sometimes inverted. "See" and "See also" references are used. No abstracts are given. To give an idea of the layout and subject headings, part of page 35 of the April-June 1958 issue is reproduced as figure 22. The yearly and the three-year cumulations follow a similar pattern. This index should be easy to use for readers and librarians that are used to dictionary catalogues. The table at the beginning of this chapter showed that this index was fourth in popularity, that no overseas utilization was reported and that it was used more by readers than by librarians.

Pacific Aeronautical Library. Uniterm index to periodicals.

This index [1] came fifth in popularity, as shown by the table at the beginning of this chapter. The same data shows less utilization overseas than in North American and less utilization by readers than by librarians.

This is a cumulative index, there being each year a cumulation for six months, nine months and the full year. A weekly list of additions can also be received by the subscriber. The purpose of this index is to make available to interested librarians the results of the periodical indexing work that the Pacific Aeronautical Library

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1 Pacific Aeronautical Library. Uniterm index to periodicals. Los Angeles, Institute of the Aeronautical Sciences, Pacific Aeronautical Library. Half-yearly.

Missile cones lick re-entry heat problem (X-17). AF Times 18:10 May 17 '58

Tool for missile research (Atmosphere Entry Simulator). il Nav Av N p 26 Apr '58

BALLISTIC MISSILES--RUSSIA

Russia's guided weapons. Kenneth W. Gatland. il RAF Flying R 13:42 June '58

BALLISTIC MISSILES--TRACKING

(Azusa system tracks missiles in flight) Air Force 41:79 May '58

Tracking long-range missiles. Raymond M. Nolan. il graph Missiles & Rockets 3:125+ Feb '58

BALLISTIC MISSILES--TRANSPORTATION

11,000-mph missile slowed to a crawl. il Air Force 41:80-81 June '58

BALLISTIC MISSILES--U.S.

A look at the second generation (of ballistic missiles). Richard E. Horner. por Air Force 41:50-52 Apr '58

BALLOONS see also AIRSHIPS

Simons wins international award. Bob Gregory. AF Times 18:13 Apr 5 '58

The strato-lab balloon system for high altitude research. Malcolm D. Ross and Lt Cdr M. Lee Lewis. il chart tab bibliog J Aviation Med 29: 375-385 May '58

BANDS (MUSIC)

Clark's band helps to preserve good will between U.S., Filipinos. AF Times 18:15 June 21 '58

Retraining set for bandsmen. AF Times 18:6 Apr 26 '58

BARRACKS AND QUARTERS see also HOUSING

BARRACKS AND QUARTERS--AIR FORCE--U.S.

11,000 (AF) families to get rent refunds. ANR 79:9 June 7 '58

Maxwell, Gunter first bases due for break on sub-

BENEFITS see BONUSES; SURVIVORS' RIGHTS AND BENEFITS; VETERANS' BENEFITS

BENSON, ROY STANLEY

Fleet Air Defense - vital new role of the cruiser. R Adm Roy S. Benson. il US Naval Inst Proc 84:46-49 June '58

BERLIN AIRLIFT

The Berlin Blockade - A Study in Cold War Politics - A Rand Corporation Research Study, by W. P. Davison. Review. AF Times 18:33 May 17 '58

BETHEL, ION MAYWOOD

How the Marines are solving their modern supply problems. Maj Gen Ion M. Bethel. il Armed Forces Mgt 4:36-37 Apr '58

BIOLOGICAL RESEARCH

ARPA seeks more money for biological tests. Missiles & Rockets 3:52 June '58

BIOLOGICAL WARFARE

Toxicological warfare. Maj Gen William M. Creasy. il Ordnance 42:962-965 May-June '58

BIRDS

It's for the birds (jet engine damage from birds). il Combat Crew 8:7 May '58

Kansas by the sea (KC-97 hits flock of gulls). il Combat Crew 8:10 May '58

BLIMPS see AIRSHIPS

BOMBER COMMAND--AIR FORCE--GT. BRIT.

The V force partners of SAC. Robert R. Rodwell. il Air Force 41:65-68+ June '58

BOMBER UNITS

17th Bombardment Wg inactivation scheduled. AF Times 18:27 June 21 '58

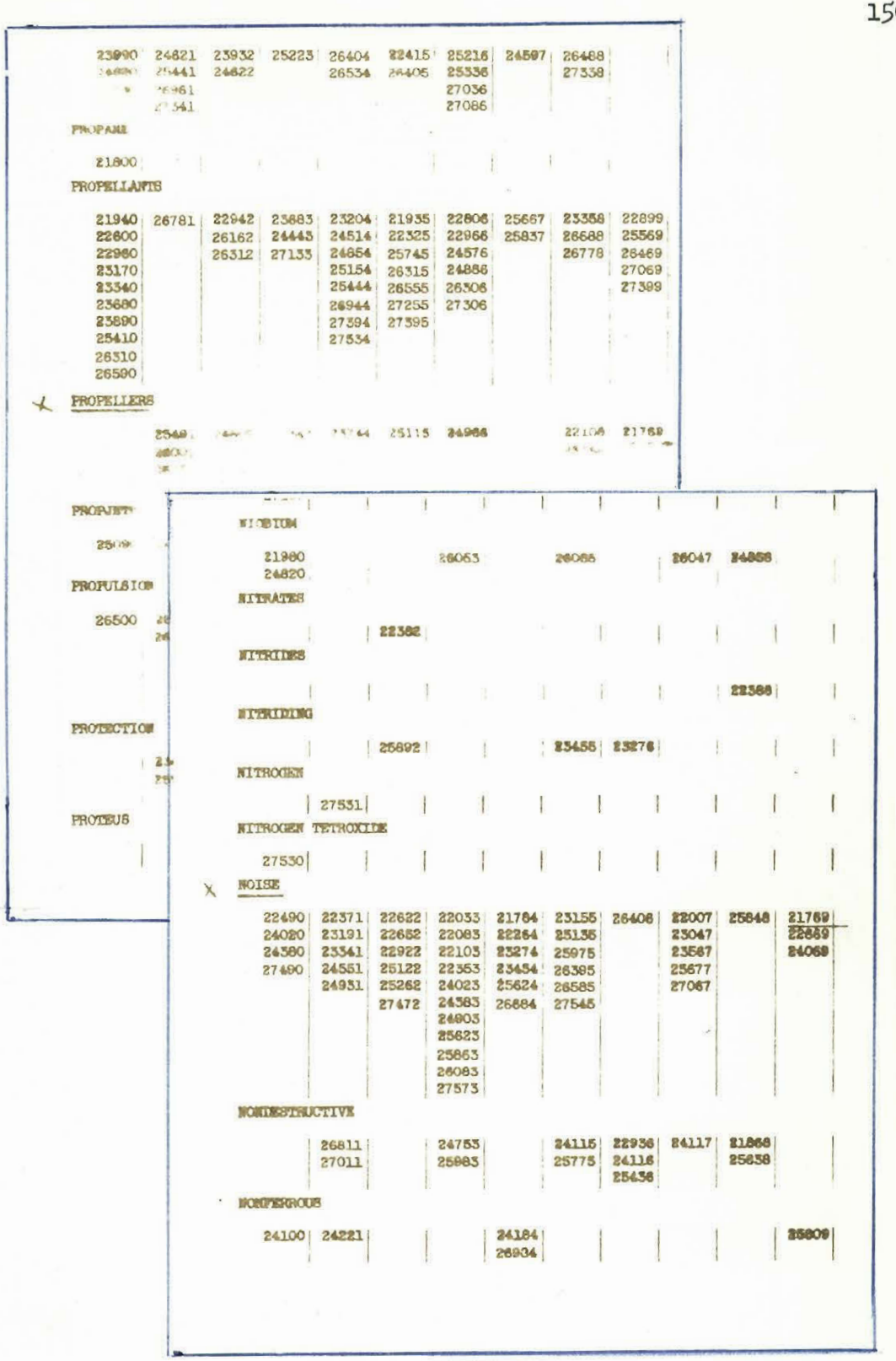
VA-151 wins the loft-y 'E'. il Nav Av N p 23 Apr '58

BOMBING, NAVIGATION AND RECONNAISSANCE COMPETITIONS--AIR FORCE

Figure 22. Air University periodical index. Reproduction of part of p.35, April-June 1958.

does for its own catalogue. Over 200 periodicals are indexed. These include the most popular aviation magazines e.g. "Flight", some house organs e.g. "Shell aviation news" and many magazines outside the immediate field of aeronautics e.g. "Factory management" and "Analytical chemistry". All these magazines are in the English language, the majority being American.

Although there is nothing particularly outstanding in the coverage of this index, it is exceptional in that the "Uniterm" method of subject analysis is used in its make-up and that it has to be searched by coordinate comparison of these "Uniterms". The first part of one of these indexes contains two identical books bound side by side. Searching for references to - let us say - "nickel alloys", the user looks up "nickel" in one book and "alloys" in the other. Under "nickel" he finds a series of accession numbers. These correspond to articles on "nickel". Under "alloys" he finds numbers corresponding to articles on "alloys". If some numbers appear under both "nickel" and "alloys", these numbers designate articles on "nickel alloys". The user notes these numbers and looks them up in the numerical index that constitutes the second part of the index. Under each of these numbers, he will find a complete bibliographical reference to an article on "nickel alloys". Readers will find in figure 23 a reproduction of a half-page containing the accession number 21769 for "propellers" and of a half-page containing the same number under "noise". Turning to figure 24 readers will find, as item 21769, the reference to an article on "propeller noise".



PROPANE

21800

PROPELLANTS

21940 26781 22942 23883 23204 21935 22806 25667 23358 22899
22600 26162 24443 24514 22325 22966 25837 26688 25569
22980 26312 27133 24854 25745 24576 26778 26469
23170 25154 26315 24886 27069
23340 25444 26555 26306 27399
23680 26944 27255 27306
23890 27394 27395
25410 27534
26310
26500

PROPELLERS

25115 24986

NIOBIUM

21980 26063 26066 26047 24868
24820

PROPULSION

NITRATES

26500 22382

NITRIDES

22388

NITRIDING

PROTECTION

25892 23455 23276

NITROGEN

PROTEUS 27531

NITROGEN TETROXIDE

27530

NOISE

22490 22371 22622 22033 21784 23155 26406 22007 25848 21769
24020 23191 22682 22083 22264 25136 23047 22869
24380 23341 22922 22103 23274 25975 23567 24068
27490 24551 25122 22353 23454 26385 25677
24931 25262 24023 25624 26585 27067
27472 24383 26884 27545
24803
25823
25863
26083
27573

NONDESTRUCTIVE

26811 24755 24115 22936 24117 21868
27011 25983 25775 24116 25658
25436

NONFERROUS

24100 24221 24184 25809
26934

Figure 23. Pacific Aeronautical Library. Uniterm index of periodicals. Reproduction of parts of pages from 1958 volume.

JAMES L. STEWART. P.403-409.
BIBLIOG.

21763. AN APPARATUS FOR MEASURING THE PIEZORESISTIVITY OF SEMICONDUCTORS. R.F. POTTER. P.427-430.

STEEL, DEC. 23, 1957
21764. HOW TO UPGRADE COLD-FINISHED STEEL. P.66-69.

ENGINEER, DEC. 6, 1957
21765. NOTES ON THE USE OF RESISTANCE STRAIN GAUGES. P.H.R. LANE. P.812-815.
21766. AERO-ENGINE PERFORMANCE MEASUREMENT. P.829-830.

COMM & ELECTRONICS, NOV. 1957
21767. MAGNETIC OUTPUT AMPLIFIERS FOR DIGITAL CONTROL. ANDRESS KERNICK. P.504-508. BIBLIOG.
21768. SAFETY SYSTEMS FOR NUCLEAR POWER REACTORS. I.M. JACOBS. P.670-

CAN AERON J, DEC. 1957
21769. NOISE RESEARCH IN THE UNITED KINGDOM. E.J. RICHARDS. P.341-356. BIBLIOG.

INDUS FINISHING, DEC. 1957
21770. ZINC COATED STEELS. LESTER F. SPENCER. P.28-35.

NATURE, NOV. 23, 1957
21771. AUTOMATIC DIGITAL CALCULATORS. ANDREW D. BOOTH. P.1089-1091.

MODERN METALS, DEC. 1957
21772. WHAT'S NEW IN MAGNESIUM. A.G. COLE. P.42-46.
21773. TITANIUM PROBLEM LICKED BY NEW HOT SPINNING PROCESS. P.66-67.

SPERRYSCOPE, VOL. 14, NO.7, 1957
21774. SHOCK WAVES IN FRONT OF REGULUS I AS MISSILE MADE STRAIGHT-DOWN DIVE ON TARGET. P.6.
21775. COMPUTER PROGRAMS "IN ENGLISH" GRACE MURRAY HOPPER. P.16-18.
21776. GAS STATIONS IN THE SKY. HERBERT A. MAY. P.22-24.

GEN RAD EXP, DEC. 1957
21777. ON THE TRACKING OF SATELLITES. ARNOLD PETERSON. P.3-6.

AEROPLANE, NOV
21786. TITANI
21787. THE LO ITS HA
21788. GUIDED P.805-
21789. NEW IN 814.
21790. UTILIT
21791. FLYING FRICKE

LIGHT METAL AG
21792. HAE PR
21793. TITANI
21794. EXTRUS BAUGH,
21795. FUTURE TURES. BIBLIO
21796. MAGNES NEW PR L.H. M

MACHINERY(BRIT
21797. THE PR NIKE M
21798. CERAMI R.M. G
21799. E.M.I. VERTIC 1349.

INST OF MECH E
21800. COMPAR AND PR N.P.W.

INST OF MECH E
21801. THE VI BIBLIO

INST OF MECH E
21802. TENSIO SOME M LOADIN P.1039

INST OF MECH E
21803. A REVI ISOTOP J.L. P

Figure 24. Pacific Aeronautical Library. Uniterm index of periodicals. Reproduction of parts of pages from 1958 volume.

As shown in figure No. 24 , this index gives a full bibliographical reference but no abstract. This "Uniterm" index is very useful for compiling bibliographies or for relatively unhurried work. It is somewhat too cumbersome to use for very quick reference. If readers are to use it, they will have to be given thorough instruction in its use. The absence of cross-references makes for difficulties inherent to all "pure" Uniterm indexes. However, a superlative job has been done in choosing the best Uniterms possible. There is little possibility of irrelevancies or false drops. Although no investigation has been made of the thoroughness of subject analysis in this index, it is obvious that the indexers have done more than pick out key-words in the titles of the articles. To emphasise the meaning of a word, a second explanatory word is sometimes added as in the case of "frequencies (electric)" or "fatigue (physiology)". When convenient and helpful, more than one word is used as a Uniterm: "boundary layer", "cross sections", "die castings", "flying boats".

Bulletin mensuel signalétique

The table at the beginning of this chapter shows that this index [1] is used more overseas than in North America (10 to 5%). It is not very popular, probably due to language difficulties. It is used more by librarians than by readers. "Bulletin mensuel signalétique" (Monthly descriptive bulletin) plays in France roughly the same role

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1 Bulletin mensuel signalétique. Paris, Service de Documentation et d'Information Technique de l'Aéronautique. Monthly.

as played in England by "Index aeronauticus". This is an organised accession list of publications received during a given month by the Service de Documentation et d'Information Technique de l'Aeronautique. Books, magazines, reports, pamphlets, etc. are indexed. The majority of the publications are in the English language, although there are some in French, Italian, German, etc. An important proportion of the references are to publications of the National Advisory Committee for Aeronautics (U.S.) There are no cumulations.

In each issue, the references are arranged numerically in order of SDIT classification numbers.[1] To locate references on a subject, the user looks up the subject in a booklet called "Index alphabetique du SDIT" and determines the classification numbers. He then turns to the monthly bulletin. An abstract is given for each entry. These abstracts are in the French language; they range from a few words to many lines. A sample half-page (figure 25) illustrates this.[2] This index, being monthly, is far more up-to-date than indexes published at greater intervals. In fact, it could be used as a publication selection tool to a certain extent. Searches covering a period of years, however, would involve searching dozens of issues.

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1 The SDIT classification system is studied in Chapter IV.

2 p.141, Oct. 1958

3f4c5
3g2c7 **Les aides radio et la navigation aérienne,** par C. Williams.

Engineering, n° 4826 (5/9/58), pp. 318-323, 11 fig. et photos.

Examen des divers systèmes d'aide à la navigation mis au point au cours des dernières années pour répondre aux besoins découlant de l'accroissement du trafic et des vitesses des avions. Revue de quelques-unes des techniques de radionavigation aérienne les plus récentes. 10 références bibliographiques.

3f4c5a **Radiogoniomètres à indication optique.**

Telefunken Zeitung, n° 120 (6/58), pp. 84-99, fig., photos, tabl.

Les propriétés physiques de différents radiogoniomètres à indication optique pour ondes courtes, par A. Troost.

Le radiogoniomètre à indication optique et à ondes courtes Telefunken, par G. Schmucker. 2 références bibliographiques.

Amélioration de la précision des résultats donnés par le radiogoniomètre à indication optique à deux canaux, par K. Baur. 5 références bibliographiques.

3f4c6 **Convertisseurs à transistors de données analogiques en données arithmétiques,** par W. B. Towles.

Electronics, n° 31 (1/8/58), pp. 90-93, 5 fig.

Description d'un convertisseur encore en essais destiné à convertir en données arithmétiques les données analogiques d'un dispositif de télémesure pour avion.

Figure 25. Bulletin mensuel signalétique. Reproduction of part of p.202, Oct. 1958.

Index of NACA technical publications

The table given at the beginning of this chapter shows that this is the most popular of all aeronautical indexes. [1] It is used as much overseas as it is in North America and it is used as much by readers as by librarians. The fact that it is used as much by readers as by librarians is exceptional. As these pages are written, the NACA (National Advisory Committee for Aeronautics) has just been changed to NASA (National Aeronautics and Space Administration). There is no reason to believe that this change will have any profound influence on this index. There will obviously be a change of title. To simplify matters, we will use the term NACA rather than NASA.

This is not an index of the publications of various organizations. As implied by its title, all the publications that it indexes are NACA publications. [2] It is therefore strictly limited in this way. However, the NACA publishes so many reports of the highest quality that the index nevertheless covers a vast field of aeronautical literature each year. Many report-publishing organizations publish indexes. The "Index of NACA technical publications" is singled out for the above reasons and because within the group of aeronautical libraries surveyed, it is even more popular than the other general indexes. This index is also of interest with regard to the other great projects of the NACA in the field

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1 Index of NACA technical publications. Washington, National Advisory Committee for Aeronautics. Annual.

2 Militarily classified publications are not indexed.

of indexing, namely the NACA classification system,[1] the NACA printed card distribution service[2] and the monthly list "NACA research abstracts" (now changed to "NASA publications announcements").

This NACA index is currently issued as a one-volume annual publication. There have been a basic 1915-1949 edition, a 1949-1951 edition and a 1951-1953 edition. Since then it has been published annually. The following notes are based on an examination of the July 1956-June 1957 issue.

From the preface, it appears that one of the aims of the index is to provide a book-form replacement for the printed cards distributed by the NACA during the period covered by a particular issue of the Index. In fact, the preface states: "Recipients maintaining card files may wish to discard those index cards on hand for unclassified research reports issued during the July 1956-June 1957 period". Although no question was included to find out the current practice in libraries in this regard, it is probable that few libraries discard their cards: the cards contain abstracts while the index entries do not; it would also be easier to search one card file than many yearly indexes.

Quoting from the preface the arrangement of each annual volume is as follows:

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1 This classification system is discussed in Chapter IV.

2 This printed card service is discussed in Chapter II.

(1) Explanatory chart of NACA publications series designations, (2) Outline of subject classification system, (3) Chronological list of NACA reports under each subject classification, (4) List of reports declassified from July 1956 through June 1957, (5) Alphabetical index to subject catalogues, and (6) Author index.

The subject classification system according to which the entries are arranged is discussed in this paper in Chapter IV. The broad major category is repeated at the top of each page (there are 12: aerodynamics, hydrodynamics, propulsion, aircraft loads and construction, materials, meteorology, operating problems, instruments, research equipment and techniques, nomenclatures, bibliographies and indexes, technical summaries). In the half-page reproduced as figure 26, classification breakdown is:

1. Aerodynamics

1.6 Rotating wings

1.6.1 Theory

This index is easy to use and most users of aeronautical libraries are familiar with its workings. The classification brings together related references: this makes for pleasant browsing.

General notes on indexes in the field of aeronautics

The indexes that we have examined overlap to a certain extent. As an example, the same NACA publications are indexed in most of them; the same applies to popular magazines such as "Flight" or "Aviation Week". However, none indexes all the items that another does, although some duplicate a large proportion of the NACA Index.

For thorough research work, aeronautical librarians would have to procure most of the above indexes and supplement them with

(1.6)
Rotating Wings

(1.6.1)
THEORY

CHARTS FOR ESTIMATING PERFORMANCE OF HIGH-PERFORMANCE HELICOPTERS. Alfred Gessow and Robert J. Tapscott. 1956. ii, 33p. diagrs. (NACA Rept. 1266. Supersedes TN 3323; TN 3482)

STATIC-THRUST MEASUREMENTS OF THE AERODYNAMIC LOADING ON A HELICOPTER ROTOR BLADE. John P. Rabbott, Jr. July 1956. 22p. diagrs., photos. (NACA TN 3688)

EQUATIONS AND PROCEDURES FOR NUMERICALLY CALCULATING THE AERODYNAMIC CHARACTERISTICS OF LIFTING ROTORS. Alfred Gessow. October 1956. 21p. diagr., tab. (NACA TN 3747)

A THEORETICAL ESTIMATE OF THE EFFECTS OF COMPRESSIBILITY ON THE PERFORMANCE OF A HELICOPTER ROTOR IN VARIOUS FLIGHT CONDITIONS. Alfred Gessow and Almer D. Crim. October 1956. 33p. diagrs. (NACA TN 3798)

DISTRIBUTION OF NORMAL COMPONENT OF INDUCED VELOCITY IN LATERAL PLANE OF A LIFTING ROTOR. Walter Castles, Jr., and Howard L. Durham, Jr., Georgia Institute of Technology. December 1956. 28p. diagrs., tabs. (NACA TN 3841)

(1.6.2)
EXPERIMENTAL STUDIES

AN EXPERIMENTAL INVESTIGATION OF THE EFFECT OF VARIOUS PARAMETERS INCLUDING TIP MACH NUMBER ON THE FLUTTER OF SOME MODEL HELICOPTER ROTOR BLADES. George W. Brooks and John E. Baker. June 1953. 68p. diagrs., photos., tabs. (NACA RM L53D24)

STATIC-THRUST MEASUREMENTS OF THE AERODYNAMIC LOADING ON A HELICOPTER ROTOR BLADE. John P. Rabbott, Jr. July 1956. 22p. diagrs., photos. (NACA TN 3688)

ANALYTICAL DETERMINATION OF THE NATURAL COUPLED FREQUENCIES AND MODE SHAPES AND THE RESPONSE TO OSCILLATING FORCING FUNCTIONS OF TANDEM HELICOPTERS. George W. Brooks and John C. Houbolt. December 1956. 46p. diagrs., tabs. (NACA TN 3849)

FLIGHT MEASUREMENTS OF THE VIBRATIONS ENCOUNTERED BY A TANDEM HELICOPTER AND A METHOD FOR MEASURING THE COUPLED RESPONSE IN FLIGHT. John E. Yeates, Jr. December 1956. 28p. diagrs., photo., tab. (NACA TN 3852)

DETERMINATION OF THE STRUCTURAL DAMPING COEFFICIENTS OF SIX FULL-SCALE HELICOPTER ROTOR BLADES OF DIFFERENT MATERIALS AND METHODS OF CONSTRUCTION. Frederick W. Gibson. December 1956. 19p. diagrs., tab. (NACA TN 3862)

INVESTIGATION OF VERTICAL DRAG AND PERIOD-

Figure 26. Index of NACA technical publications. Reproduction of part of p.70, July 1956 - June 1957 volume.

some of the following:

1) Indexes of a more general nature, such as Engineering index, Subject guide to books in print, Cumulative book index etc. To question No. 50 "Do you receive general technical indexes such as Engineering index", 45 librarians replied affirmatively. 31 of these libraries are in North America and 14 overseas.
2) Abstracting publications such as Science abstracts, ASTIA title announcement bulletin, Airplane patent digest, etc.
3) Indexes of magazines.
4) Commercially available printed card services, such as that offered by the Library of Congress.

CONCLUSION

As can be seen from this survey, the aeronautical librarian has at his disposal an important number of published classification schemes, subject heading lists, indexes and abstracting publications. Even though some of these tools are obsolescent, he is still better served than librarians in some of the other branches of technology such as electronics. These tools, at least the specialized ones, are usually of his own making. They have been developed either by aeronautical organizations or by aeronautical librarians in co-operation with library associations.

The aeronautical librarian usually makes use of these tools, although he is very partial to those developed in his geographical area (they serve his purpose best) and has a tendency to make less use of those developed elsewhere. When dissatisfied with these available tools, he does not hesitate to develop his own.

The same applies to techniques and methods. Here, regional fashion is even more influential. The vogue of classified catalogues in Europe and alphabetical catalogues in America is a striking example.

Examining the tools and techniques in use in the North American aeronautical library, one finds a remarkable degree of uniformity and a marked resemblance to those of the public library. Such is not the case, however, in Europe, where there is less uniformity and where

aeronautical librarians are more inclined to develop their own techniques.

Research towards the development of better methods of subject analysis and retrieval goes on, especially for the subject fields of "aerodynamics" and "structures", although the literature search shows that there was more interest in sophisticated methods of retrieval (such as Uniterm and punched cards) a few years ago than there is now.

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Russell, Patricia J. Aeronautical indexing - past, present and future - in the Aeronautical Research Laboratories Library. Cranfield, Eng., Association of Special Libraries and Information Bureaux, 1953. 6p. (ASLIB Preprint No.2)

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Shaw, Ralph R. Machines and the bibliographical problem of the twentieth century. (In Bibliography in an age of science. Urbana, Ill., University of Illinois Press, 1951. p.37-71)

Shera, Jesse H. Classification: current functions and applications to the subject analysis of library materials. (In Tauber, Maurice F., ed. Subject analysis of library materials. New York, Columbia University Press, c1953. p.35)

Shera, Jesse H. and others, eds. Information systems in documentation. New York, Interscience Publishers, 1957. 639p. ("Advances in documentation and library science", v.2)

Solvey, J. A punch card system for structures. Farnborough, Eng. Royal Aircraft Establishment, 1954. 6p. (RAE Library Memorandum 20)

Special Libraries Association. Engineering Section. Bibliography of engineering abstracting services; ed. by Miriam M. Landuyt. New York, 1955. 37p. (S.L.A. Bibliography, No. 1)

Staples, K.J. and Shaw, M.M. N.L.L. card catalogue of aerodynamic measurements. Problems of an indexer. Farnborough, Eng. Royal Aircraft Establishment. 1954. 6p. (RAE Library Memorandum No. 17)

Taube, Mortimer, and others. Studies in coordinate indexing. Washington, Documentation Inc., 1953-1957. 4v.

Taylor, Kanardy L. Subject catalogs vs classified catalogs. (In Tauber, Maurice F. ed. The subject analysis of library materials. New York, Columbia University Press, c1953. p.100-113)

Terminological inexactitudes. Editorial. (In Flight, v.70, p.663, 26 Oct, 1956)

Thorne, R.G. The documentation of information in the aeronautical and allied fields, Farnborough, Eng. Royal Aircraft Establishment, 1951. 7p. (RAE Library Memorandum 3)

Thorne, R.G. The efficiency of subject catalogues, and the cost of information searches. Farnborough, Eng. Royal Aircraft Establishment, 1955. 21p. (RAE Library Memorandum No. 22)

Thorne, R.G. A method for assessing the efficiency of a subject catalogue. Franborough, Eng. Royal Aircraft Establishment, 1954. 5p. (RAE Library Memorandum 7)

U.S. Armed Services Technical Information Agency. Installation manual for the Uniterm system of coordinate indexing. Dayton, Ohio, Document Service Center, 1953. 25p.

Vessey, H.F. Report on retrieval systems II. Paris, NATO, 1955. 24p. (Advisory Group for Aeronautical Research and Development, DOC/6.4)

Vessey, H.F. Retrieval systems - a note on their use and test with particular reference to the N.L.L. index. Farnborough, Eng. Royal Aircraft Establishment, 1954. 4p. (RAE Library Memorandum No. 14)

Vessey, H.F. Tests of N.L.L. card catalogue of aerodynamic measurements. Farnborough, Eng. Royal Aircraft Establishment, 1954. 32p. (RAE Library Memorandum No. 18)

Vessey, H.F. and Seymour, J.R. Test of N.L.L. card catalogue of aerodynamic measurements - II. Farnborough, Eng. Royal Aircraft Establishment, 1956. 29p. (RAE Library Memorandum No. 28)

The views of aerodynamicists on desirable systems for the indexing and codification of aerodynamic information. Cranfield, Eng. Association of Special Libraries and Information Bureaux, 1953. 5p. (ASLIB Aeronautical Group, Second annual conference, 1953. Preprint No. 13)

Wright, R.C. Documentation research: an account of work projected as in progress at the R.A.E. Farnborough, Eng. Royal Aircraft Establishment, 1955. 6p. (RAE Library Memorandum 21)

Wright, R.C. and Dyke, Mary. The Royal Aircraft Establishment Library service. Farnborough, Eng. The Establishment, 1954. 13p. (RAE Library Memorandum 12)

Wright, R.C. and Wilson, C.W.J. Classification with Peek-a-boo for indexing documents on aerodynamics: an experiment in retrieval. (In International Conference on Scientific Information, Washington, 1958. Preprints of papers. Washington, National Academy of Sciences and National Research Council, 1958, area 4, p.112,113,117)

APPENDIX A

For information used in this thesis, the writer is indebted to the libraries of the following organizations. A few of these organizations have indicated that they did not have a library. This information, however negative, has been useful.

Advisory Group for Aeronautical Research and Development, Paris, France.

Aer Lingus, Dublin, Ireland.

Aeronautica Industrial, Madrid, Spain.

Aeronautical Research Council, Teddington, England.

Aeronautical Research Institute of Sweden, Ulvsunda, Sweden.

Aeronautical Research Laboratories, Melbourne, Australia.

Air Ministry, London, England.

Air University, Maxwell Air Force Base, U.S.

Aircraft Research Association Ltd, Bedford, England.

Associazione Italiana di Aerotecnica, Rome, Italy.

A.V. Roe & Co. Ltd, Middleton, England.

Avro Aircraft Ltd, Malton, Canada.

Beech Aircraft Corp., Wichita, U.S.

Bell Aircraft Corp., Buffalo, U.S.

Blackburn and General Aircraft Ltd, Brough, England.

Boeing Airplane Co., Seattle, U.S.

Boeing Airplane Co., Wichita, U.S.

Boulton Paul Aircraft Ltd,. Wolverhampton, England.

Bristol Aeroplane Co. Ltd, Filton, England.

British Overseas Airways Corp., Brentford, England.

California Institute of Technology, Pasedena, U.S.

Canadian Pacific Air Lines, Ltd, Vancouver, Canada.

Centre de Formation en Aérodynamique Expérimentale, Rhode-Saint-Genèse, Belgium.

Chance Vought Aircraft Inc., Dallas, U.S.

College of Aeronautics, Cranfield, England.

Construcciones Aeronauticas, Madrid, Spain.

Convair, Forth Worth, U.S.

Cornell Aeronautical Laboratory, Inc., Buffalo, U.S.

Department of Civil Aviation, Melbourne, Australia.

Deutsche Forschungd-Anstalt fur Luftfahrt, Braunchweig, Germany.

Douglas Aircraft Co., Inc., Santa Monica, U.S.

English Electric Co. Ltd, Whetstone, England.

Fairchild Engine and Airplane Corp., Hagerstown, U.S.

Fairey Aviation Co. Ltd, Hayes, England.

Folland Aircraft Ltd, Southampton, U.S.

Glenn L. Martin Co., Baltimore, U.S.

Gloster Aircraft Co. Ltd, Gloucester, England.

Grumman Aircraft Engineering Corp., Bethpage, U.S.

Hawker Aircraft Ltd, Kingston-on-Thames, England.

Hiller Helicopters, Palo Alto, U.S.

Hindustan Aircraft Ltd, Bangalore District, India.

Hunting Percival Aircraft Ltd, Luton, England.

Institute of the Aeronautical Sciences, Pacific Aeronautical Library, Los Angeles, U.S.

Instituto Nacional de Tecnica Aeronautica, Madrid, Spain.

International Civil Aviation Organisation, Montreal, Canada.

Kaman Aircraft Corp., Bloomfield, U.S.

Lockheed Aircraft Corp., Marietta, U.S.

McDonnell Aircraft Corp., St. Louis, U.S.

Ministero Difesa Aeronautica, Rome, Italy.

Nationaal Luchtvaartlaboratorium, Amsterdam, Holland.

National Advisory Committee for Aeronautics, Washington, U.S.

National Aeronautical Establishment, Ottawa, Canada.

Northrop Aircraft, Inc., Hawthorne, U.S.

N.V. Koninklijke Nederlandse Vliegtuigenfabriek "Fokker", Amsterdam, Holland.

Pan American World Airways, Inc., New York, U.S.

Pan American World Airways, Inc., San Francisco, U.S.

Parks College of Aeronautical Technology, St. Louis, U.S.

Princeton University, James Forrestal Research Center, Princeton, U.S.

Republic Aviation Corp., Farmingdale, U.S.

Royal Aeronautical Society, London, England.

Royal Aeronautical Society, Sydney, Australia.

Royal Aircraft Establishment, Bedford, England.

Royal Aircraft Establishment, Farnborough, England.

Royal Dutch Airlines (KLM), The Hague, Holland.

Royal Institute of Technology, Stockholm, Sweden.

Saunders-Roe Ltd, Osborne, England.

Scandinavian Airlines System, Fornebu, Norway.

Service de Documentation et d'Information Technique de l'Aéronautique, Paris, France.

Short Brothers and Harland Ltd, Belfast, N. Ireland.

Sikorsky Aircraft, Ind., Bridgeport, U.S.

Sir W.G. Armstrong Whitworth Aircraft Ltd, Baginton, England.

Societa per Azioni Fiat, Turin, Italy.

Societe Nationale de Constructions Aeronautiques, Paris, France.

Svenska Aeroplan Aktiebolaget, Linkoping, Sweden.

Technische Hogeschool, Sub-Afdelig Vliegtuigbouwkunde, Delft, Holland.

Temco Aircraft Corp., Dallas, U.S.

Trans-Canada Air Lines, Montreal, Canada.

Union Syndicale des Industries Aéronautiques, Paris, France.

United Air Lines, Inc,. Chicago, U.S.

United Aircraft Corp., East Hartford, U.S.

U.S. Navy Bureau of Aeronautics, Washington, U.S.

Vertol Aircraft Corp., Morton, U.S.

Vickers-Armstrong (Aircraft) Ltd, Weybridge, England.

Vickers-Armstrong Supermarine Works, Winchester, England.

APPENDIX B

GEOGRAPHICAL DISTRIBUTION OF QUERIES AND REPLIES:

	Queried	Answered
Argentina	2	0
Australia	4	3
Belgium	3	1
Canada	9	6
China	1	0
Denmark	1	0
France	24	5
Germany	5	1
England	37	23
Holland	4	4
India	2	1
Italy	9	3
Japan	2	0
N. Ireland	1	1
Norway	1	1
Spain	7	3
Sweden	5	3
Switzerland	2	0
Turkey	1	0
United States	44	35
TOTAL	164	90

APPENDIX C

REFERENCE WORKS USED TO COMPILE MAILING LIST FOR QUESTIONNAIRE

Jane's all the world's aircraft 1956-1957. London, Jane's All the World's Aircraft Pub. Co., 1957. 454p.

World of learning, 1956. London, Europa Publications. 1064p.

Interavia ABC 1955. Geneva, Interavia, 1954. 1147p.

Cleverdon, Cyril W. ed. Handbook of sources of aeronautical information. Paris, Advisory Group for Aeronautical Research and Development, 1955. Various pagings.

ASLIB year book, 1957-1958. London, Association of Scientific Libraries, 1957. 194p.

Special Library Association. Directory of members 1951. New York, 1951. 289p.

American library directory, 20th ed. New York, Bowker, 1954. 880p.

Special Library Association. Directory of special libraries. Comp. by Isabel L. Towner. New York, 1953. 297p.

APPENDIX D

COPIES OF QUESTIONNAIRES

The following six pages are made up of a copy of the English version of the questionnaire and a copy of the French version. These are the original mimeographed sheets as mailed to the libraries that were surveyed. On the original versions, however, the questions were not numbered.

Mail to:
R.C. Lavergne,
Supervisor, Engineering Library,
Canadair Ltd,
P.O. Box 6087,
Montreal, P.Q., Canada.

QUESTIONNAIRE

The majority of the questions that follow can be answered by checkmarks. If you wish to give details, please do not hesitate to do so.

TYPE OF SUBJECT CATALOGUE IN YOUR LIBRARY

		if "yes", check here
1	Do you have a catalogue organized by subjects?	
2	Is this catalogue interfiled with other entries such as author or title entries?	
3	Is this subject catalogue on cards?	
4	Is this subject catalogue in book or ledger form?	
5	Is this subject catalogue on punched cards?	
6	Does this subject catalogue include books?	
7	Does this subject catalogue include monographs in serial form such as NACA Reports?	
8	Does this subject catalogue include pamphlets?	
9	Is this subject catalogue completely alphabetical?	
10	Is this subject catalogue a classified (classed) catalogue?	
11	Do you have a separate classified catalogue for NACA cards?	
12	Do you have a separate classified catalogue for SDIT cards?	

USE OF THE SUBJECT CATALOGUE IN YOUR LIBRARY

13	Is your subject catalogue used mostly by the librarians?	
14	.. .. by readers without the help of librarians?	
15	.. .. by readers with the help of librarians?	
16	.. .. for quick reference?	
17	.. .. for lengthy searches?	

SUBJECT HEADINGS

		if "yes", check here
18	Do you use the following lists of subject headings:	
19	Library of Congress. Subject headings used in the dictionary catalogs of L.C.	
20	Library of Congress. Technical Information Div. List of subject headings	
21	Sears list of subject headings	
22	Spec. Lib. Assoc. Subject headings for aeronautical engineering Libraries. 1949	
23	Spec. Lib. Assoc. Aviation subject headings, a concise list. 1949	
24	Others (please give publisher and title)	
25	Do you maintain a subject authority file?	
26	Do you use bibliographical indexes such as "Aeronautical Engineering Index" as a source of subject headings?	
27	Do you use mostly one-word subject headings?	
28	Do you use only one-word subject headings?	
29	Do you use the Uniterm (coordinate indexing) system of posting subject headings?	
30	Do you use mostly direct subject headings such as "supersonic flow"?	
31	Do you use mostly inverted subject headings such as "flow, supersonic"?	

CLASSIFICATION SYSTEMS

Please indicate use of classification schemes, if applicable:

		use	use for books	use for reports	use with modifications
32	Dewey				
33	Library of Congress				
34	UDC English abridged				
35	UDC English unabridged				
36	UDC French unabridged				
37	UDC as translated and expanded by the RAE				
38	NACA				
39	Institute of the Aeronautical Sciences. Standard aeronautical indexing system				
40	SDIT				
41	Others				
42	Own locally developed scheme				

INDEXES TO PUBLICATIONS IN THE FIELD OF AERONAUTICS

Please indicate receipt and use of these specialized indexes, if appropriate:

		received	used mostly by librarians	used mostly by readers
43	Aeronautical engineering index			
44	Index aeronauticus			
45	Index of NACA technical publications			
46	Air University periodical index			
47	Pacific Aeronautical Library. Uniterm index to periodicals			
48	SDIT. Bulletin mensuel signalétique			
49	Other indexes specialized in aeronautics (please give publisher and title)			

MISCELLANEOUS QUESTIONS

		if "yes", check here
50	Do you receive general technical indexes such as "Engineering Index"?	
	Are your subject headings and/or classification numbers assigned by:	
51	a librarian?	
52	a subject specialist who is not a librarian?	
53	a librarian who is also a subject specialist?	
54	Do you type abstracts, reviews or lists of contents on your subject cards?	
55	Does your organization issue "ready-made" catalogue cards with its research reports?	
56	Would you like to receive a tabulation of answers made by librarians to this questionnaire?	

57 How many people are working in your library? .....

Adresser a:
R.C. Lavergne,
Supervisor, Engineering Library,
Canadair Ltd, P.O. Box 6087,
Montreal, P.Q., Canada.

QUESTIONNAIRE

Il est possible de répondre a la plupart des questions ci-dessous par un "X" ou un crochet. S'il vous plait de donner des indications supplémentaires, n'hésitez pas à le faire.

	LE CATALOGUE PAR SUJETS DANS VOTRE BIBLIOTHEQUE	si "oui" indiquez par un crochet
1	Avez-vous un catalogue organisé par sujets?	
2	Les fiches ou entrées de ce catalogue sont-elles intercalées avec les fiches ou entrées de titres ou d'auteurs?	
3	Ce catalogue par sujets est-il sur fiches?	
4	.. .. est-il en volume?	
5	.. .. est-il sur fiches perforées?	
6	.. .. inclut-il des livres?	
7	.. .. inclut-il des monographies en series telles que celles du NACA?	
8	.. .. inclut-il des brochures?	
9	.. .. est-il organisé uniquement par ordre alphabétique?	
10	.. .. est-il un catalogue systématique?	
11	Avez-vous un catalogue systématique distinct pour les fiches NACA?	
12	Avez-vous un catalogue systématique distinct pour les fiches SDIT?	
	USAGE DU CATALOGUE PAR SUJETS DANS VOTRE BIBLIOTHEQUE	
13	Ce catalogue par sujets est-il employé surtout par les bibliothécaires?	
14	.. .. .. par les lecteurs, sans l'aide des bibliothécaires?	
15	.. .. .. par les lecteurs, avec l'aide des bibliothécaires?	
16	.. .. .. pour la consultation rapide?	
17	.. .. .. pour des recherches prolongées?	

VEDETTES-MATIERE

		si "oui", indiquez par un crochet
18	Faites-vous usage des listes de vedettes-matiere suivantes:	
19	Library of Congress. Subject headings used in the dict. catalogs of L.C.....	
20	Library of Congress. Technical Information Div. List of subject headings...	
21	Sears list of subject headings.....	
22	Spec.Lib. Assoc. Subject headings for aero. engineering Libraries. 1949.....	
23	Spec.Lib. Assoc. Aviation subject headings, a concise list. 1949.....	
23.5	Liste des vedettes-matière de Biblio.....	
24	Autres (s'il-vous-plait, inscrire l'éditeur et le titre)	
25	Avez-vous une table alphabétique des mots-matières que vous avez déjà employés?.....	
26	Dans votre choix de vedettes-matières, vous inspirez-vous parfois de celles employées dans les listes par sujets telles que l'"Index Aeronauticus"?.....	
27	Vous servez-vous surtout de vedettes-matière d'un seul mot?.....	
28	Vous servez-vous toujours de vedettes-matière d'un seul mot?.....	
29	Vous servez-vous du systeme "Uniterm" d'analyse de sujets a l'aide de coordonnées?.....	

SYSTEMES DE CLASSIFICATION

Indiquez l'usage que vous faites des systèmes de classification suivants:

		Vous en servez	Vous en servez pour les livres	Vous en servez pour monographies	Vous en servez avec certaines modifications
32	Dewey.....				
33	Library of Congress.....				
34	UDC English abridged.....				
35	UDC English unabridged.....				
36	UDC Francais, non abrege.....				
37	UDC tel que traduit et augmente par la RAE.....				
38	NACA.....				
39	Institute of the Aeronautical Sciences. Standard aeronautical indexing system.....				
40	SDIT.....				
41	Autres.....				
42	Votre propre système de classification.....				

LISTES PAR SUJETS D'OUVRAGES ET D'ARTICLES DE PERIODIQUES SUR L'AERONAUTIQUE

S'il-vous-plait indiquez si vous recevez les listes suivantes et quel usage en est fait:

		vous y souscrivez	utilisée surtout par les bibliothécaires	utilisée surtout par les lecteurs
43	Aeronautical Engineering Index			
44	Index Aeronauticus			
45	Index of NACA technical publications			
46	Air University periodical index			
47	Pacific Aeronautical Library. Uniterm index to periodicals			
48	SDIT. Bulletin mensuel signalétique			
49	Autres listes dans le domaine de l'aéronautique (indiquer l'éditeur et le titre)			

QUESTIONS DIVERSES

		si "oui", indiquez par un crochet
50	Recevez-vous des listes d'ouvrages techniques plus généraux, telles que l'"Engineering Index"?	
	Les vedettes-matière et/ou les nombres classificateurs sont-ils choisis par:	
51	un bibliothécaire?	
52	un technicien expert en la matière mais qui n'est pas un bibliothécaire?	
53	un technicien expert en la matière qui est aussi un bibliothécaire?	
54	Inscrivez-vous des analyses, des critiques ou des tables de matières sur vos fiches de catalogue?	
55	Votre organisation distribue-t-elle des fiches de catalogue toutes-faites avec les monographies qu'elle publie?	
56	Desireriez-vous recevoir une compilation statistique des réponses faites a ce questionnaire?	

57 Quel est le personnel total de votre bibliothèque?.....