U.S. CENTRAL AIR DOCUMENTS OFFICE.

PROCEEDINGS OF THE CONFERENCE ON
PROBLEMS OF CENTRALIZED DOCUMENTATION.

Problems Of Centralized Documentation

Conference Proceedings

JUNE 1949

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of the

CONFERENCE

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PROBLEMS OF CENTRALIZED DOCUMENTATION

Held at

Central Air Documents Office
Wright-Patterson Air Force Base
Dayton, Ohio

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Compiled and Edited
by
George R. Hicks

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Wright-Patterson Air Force Base
Dayton, Ohio

ABOUT CADO

The Central Air Documents Office (CADO) is a documentation service established by joint agreement between the Department of the Navy and the Department of the Air Force, dated 13 October 1948, to assure that all research and development activities are concurrently informed of the status of all projects in the fields of aeronautical science and technology. Under the guidance of the Research and Development Board of the National Military Establishment, CADO is designed to acquire, publish, and distribute all information of general air interest to Government agencies concerned, to accredited contractors of the Navy and Air Force who require such information for the prosecution of research development on contracts for the Services, and to such institutions and organizations as is commensurate with the National interest.

This concept of a documentation agency presupposes the centralized acquisition of all scientific and technical material of general air interest to be accessioned and selectively distributed by this organization in order to fulfill its mission as a service to research and development.

FOREWORD

The explosive rate at which human knowledge and especially aeronautics and its allied sciences have expanded during the past few years has brought about a similarly rapid expansion of the documentary material in which this newly gained knowledge is recorded.

Oddly enough, less use is being made of scientific records as their number and specialization grow. The main reason for this is that the modern engineer would have to spend so much time in literature search - if he were to make a thorough job of it - that this would become too costly and time consuming an undertaking. As a result, he tends to revert to the other extreme - to minimize or even completely forego literature search prior to initiating a new project, and to rather start from scratch, even at the risk of duplicating the efforts of others.

Obviously, neither of these approaches is desirable, and the only solution lies in devising methods and equipment which would make it possible for the scientist to derive the maximum possible benefit from the existing reference literature at a minimum of effort and time. This has led to developments which have made documentation a science in its own right - a science as complex and far reaching as few others. It embraces such phases as classification, indexing, abstracts and digests, reproduction, standardization, quality control, and, last but not least, "machine tools"; i.e., automatic machinery designed to rapidly organize and select scientific data.

The purpose of this new documentation science is essentially to gather all past and existing knowledge at an adequate rate of speed and to process it in such a manner that it can be made available, on a highly selective basis, to the user, giving him not more and also not less than he can practicably digest.

In order to achieve this purpose, documentation is becoming increasingly centralized, as acquisition, cataloging, and dissemination can usually be handled more effectively if carried on on a reasonably large scale. This does not mean that special libraries should be relegated to a secondary role. On the contrary, the task of centralized documentation is merely to perform the more general functions of large-scale acquisition and processing and to supply its products to the special libraries which, in turn, use these products as tools to serve their patrons better, faster, and more comprehensively.

A typical example of such a centralized documentation activity is the Central Air Documents Office of the Navy and Air Force, formerly Air Documents Division. This organization is charged with the acquisition of all scientific documents of general air interest and their dissemination to agencies and contractors of the armed forces in accordance with military security requirements and pertinent fields of interest of the individual recipients. This task is such a large one and so much aggravated by considerations of security, budgetary limitations, and pressure of time that CADO - the Central Air Documents Office - can be said to have faced and to still face almost every problem existing in centralized documentation. This has resulted in the establishment of new systems, methods, and procedures which, so far, have made it possible to meet the requirements of the large number and variety of organizations depending upon CADO for their technical information. On the other hand, CADO realized that there was very much room for improvement and that, above all, it could not expect its "customers" to accept its policies for handling documentary material unless they - the customers - had an opportunity to help in shaping these policies. Finally, CADO, as one of the largest centralized documentation activities in the country, considered itself justified in getting together representatives of similar activities, who faced identical problems for an exchange of ideas.

In view of the above, the Central Air Documents Office called a Conference on the Problems of Centralized Documentation which was held in its offices on 11, 12, and 13 April 1949. Some 200 representatives from military and governmental agencies, industrial organizations, scientific institutions, and library societies accepted this invitation and took part in the panel discussions covered in this Report. The purpose of the Conference was not to try to solve any of the numerous problems existing in the documentation field but rather to bring them out into the open, define them, and obtain suggestions as to the most desirable course of action to be taken. This purpose was fully achieved, thanks to the splendid cooperation of all those who attended.

However, the most important result of the Conference was the realization that centralized documentation has graduated from the background stage to a full-fledged science, and that close cooperation is required between the creators of information; those that collect, process, and disseminate it; and those who use it. Presentation of machine methods and ingenious machinery for handling information further emphasized the rising trend toward broadening the scope of documentation and its wider use in scientific research and development.

These and many other points were highlighted in the six panel discussions and aroused so much interest that the conferees requested a complete transcript of the discussions. Such a transcript is presented herewith, and it is hoped that it will serve to supplement and clarify the many items which were covered.

A. A. ARNHYM
Colonel, USAF
Director, Central Air Documents Office

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CONTENTS

CONFERENCE PROGRAM

MONDAY, 11 APRIL

0900 - **INTRODUCTION**
Major General O. R. Cook
Rear Admiral L. M. Grant
Col A. A. Arnhym

0915 - **TOUR**
Chairman - E. A. Williamson

1000 - **PANEL ON THE STANDARD AERONAUTICAL INDEXING SYSTEM**
Chairman - L. E. Neville, Institute of the Aeronautical Sciences

1130 - **LUNCHEON** - Wright-Patterson Officers' Club

1300 - **PANEL ON THE AIR TECHNICAL INDEX**
Chairman, E. B. Jackson, Civilian Chief,
Document Requirements Section CADO

1830 - **RECEPTION AND BANQUET** - Civilian Club, Wright-Patterson Air Force Base
Speaker - Major General L. C. Craigie, Commandant,
USAF Institute of Technology

TUESDAY, 12 APRIL

0900 - **PANEL ON MINIATURIZATION IN DOCUMENTATION**
Chairman - Commander W. H. Munson, Assistant Director (Navy), CADO

1130 - **LUNCHEON** - Wright-Patterson Officers' Club

1300 - **PANEL ON MACHINE METHODS IN DOCUMENTATION**
Chairman - E. V. Lee, Deputy Director, CADO

WEDNESDAY, 13 APRIL

0900 - **PANEL ON REPORTS STANDARDIZATION**
Chairman - J. J. Boucher, Project Coordinator, CADO

1130 - **LUNCHEON** - Wright-Patterson Officers' Club

1300 - **PANEL ON DOCUMENT EXCHANGE**
Chairman - Capt J. L. Ferguson, Chief,
Document Requirements Section, CADO

INTRODUCTORY REMARKS

I

Major General O. R. Cook, USAF
Deputy to the Commanding General for Operations, Air Materiel Command

In behalf of General McNarney and General Chidlaw, the Commanding General and Deputy Commanding General, respectively, I extend to you the sincere welcome of the Air Materiel Command.

It is significant and encouraging to find that so many government, scientific, and commercial organizations have responded to the invitation of the Central Air Documents Office to attend this Conference on the Problems of Centralized Documentation. We here at the Air Materiel Command carry a tremendous responsibility in the development of, and research in, materiel for the Air Force, and it is our duty to not only coordinate all efforts along these lines but also to provide the many institutions and organizations which assist us in this endeavor with some of the necessary tools - foremost among them the technical and scientific information generated in this field from day to day. The Navy faces a similar problem in connection with naval aircraft, and it is therefore of the utmost importance to both Services to have available for their own agencies and their contractors such a highly developed documentation center as is represented by CADO.

The fact that this enterprise is a joint one means not only that it can be operated on a more economical and efficient basis but also that its scope can be a much broader one and that it can much better fulfill its mission of enhancing and accelerating the exchange of vital data.

Obviously, such a novel and complex undertaking meets with innumerable problems, not all of which are confined to the internal operations of such an effort. There is only one way of effectively attacking these problems - namely for those who render the service and those who receive the service to get together and determine the solutions.

That is the purpose of this Conference and that is why it is so gratifying to have so many of you here to help us with the problems of centralized documentation. I am confident that your deliberations will be productive of ways and means of going forward in this most important endeavor.

II

Rear Admiral L. M. Grant, USN
Bureau of Aeronautics General Representative, Central District, Wright-Patterson Air Force Base

I would like to add a note of welcome from the Navy to that extended by General Cook for the Air Force.

In a way, I question whether it is altogether proper that I mention the Navy and the Air Force on this occasion. Some of you may have possibly heard something of the criticisms that have been made of the Services for their failure to accomplish unification. Be that as it may, the Central Air Documents Office not only has complete unity of interest, thought, and effort, but has enjoyed it for several years. This is due largely to the fact that Colonel Arnhym of the Air Force and Captain Draim of the Navy saw eye to eye in the matter of the desirability of a joint air documents activity and, in 1946, initiated the operation of this office which was formally recognized and established only a few months ago. I am told that CADO is so well unified that one hardly ever hears the words Navy and Air Force mentioned.

It is gratifying to see the very great response to CADO's invitation to participate in this conference. You probably noted the emphasis, in the invitation, that was placed on the desire of CADO to provide the kind of services which you want and require. To do this, there is need for your comments, suggestions, and constructive criticism. So lend your full support and don't pull any punches.

I hope that you will have a pleasant and successful conference.

THE STANDARD AERONAUTICAL INDEXING SYSTEM

Panel Chairman:	Mr. Leslie E. Neville	Director, SAIS
Members:	Mr. Ned M. Thorne	Dayton Representative, SAIS
	Mr. Ruland M. Woodham	Administrator, SAIS
	Mr. Maurice H. Smith	Librarian, Institute of the Aeronautical Sciences

Mr. Neville

The best way to save time in research and development is to establish a system for the discreet exchange of technical information even though it is of a classified nature. Upon such a premise, the Air Technical Index was conceived. To set up an automatic, selective exchange of classified information, the Air Technical Index needed a truly functional breakdown of the field of aeronautics. This distribution tool would insure that each research group receives material pertinent to its field but nothing more. That breakdown is the Standard Aeronautical Indexing System.

Early in 1947, a contract was made with the Institute of the Aeronautical Sciences to undertake the establishing and coordinating of the SAIS, and a staff of engineers and librarians was recruited for the project. The staff included representatives in Dayton and Los Angeles whose job it was to contact the Wright Field divisions and industry in the Middle West and on the West Coast. The remainder of the staff was located at the Institute Headquarters in New York and covered the eastern territory.

These staff members were very carefully selected for engineering background and library qualifications. IAS wanted engineers who could see both the forest and the trees - men who had had executive positions in engineering but were still familiar with detailed problems. It wanted librarians who knew library science well enough to know its weaknesses and its strength - men who could see beyond the narrow views sometimes found in all professions.

IAS is rather happy about the people it picked. It is also happy about the cooperation it has received from about 2000 of the top authorities in the field of Aeronautics.

It is happy, too, about the cooperation it has received from many Government agencies including those participating in the sponsorship of the SAIS: the Central Air Documents Office; the Engineering Division, AMC; the Bureau of Aeronautics; and the Office of Naval Research. And it is even happier about the willingness of the Chief and other representatives of the Central Air Documents Office to accept the opinions of the experts wherever it was possible to fit them to the needs of the Air Technical Index. Without that, the work would have been futile.

In order to obtain the best possible results, the SAIS had to assume a completely neutral and impartial position in approaching and conducting this project. The position is perhaps best expressed by a line from a recently popular song: "Doin' what comes natcherly."

That is how the SAIS was coordinated. It just came "natcherly" out of the thoughts of thousands of experts.

The SAIS has been accused of growing like Topsy. That is a tribute, for the SAIS is a consensus of the best thinking that could be brought to bear.

The president of one of the largest aviation companies volunteered the information that he had been studying the SAIS in the hope that he could offer more constructive comments on it. He is among the many important executives who have contributed a great deal to it already. He added that, after considerable study, he had not been able to offer any further suggestions for change. That, naturally, was another tribute to our progress so far.

To illustrate the basic structure of the SAIS, it can be shown as one branch of the tree of human knowledge. Its sub-branches are the divisions of the SAIS, and its twigs are the sections. Each twig has its leaves which are subject headings.

This structure was developed by sending out a questionnaire to 3000 upper-grade members of the IAS and to 2000 users of the services of the old Air Documents Division. Each one was asked his major specialty.

The replies were studied carefully, and grouped and compared with the functional breakdown of the engineering activities of the Air Force and Navy. The result of this first phase of the work was the list of divisions of the SAIS.

In the meantime, two other important steps had been taken. First, the authorities were mobilized and invited to assist the IAS. Simultaneously, the IAS gathered together every existing classification system and subject heading list it could find. And it found some good ones in some very strange places.

It then felt that it was ready to develop the divisions of the SAIS (Fig. 1) which now numbers approximately fifty. Several have been dropped, several added, and two are now under consideration for elimination.

With the authorities organized according to the tentative division list of the SAIS, IAS began to contact them systematically. Taking the divisions in groups, it assigned them one at a time to individual members of the staff. First, the staff member assigned to a given division would consult the accumulation of classification systems and subject heading lists to see what had been done before. Then books and documents on the particular subject were studied.

In the meantime, the Dayton representative of the IAS contacted the specialized engineering groups concerned with the division at Wright Field and developed a tentative breakdown of the division into functional sections. By the time the list of sections had been forwarded to New York, the staff member also had a tentative breakdown. The two were compared and discussed with selected local authorities on the subject. The result was a second tentative breakdown ready for full coordination.

The tentative breakdown, with explanations and with some of the questions which had arisen in preliminary coordination, was then mailed to the authorities selected for the subject division. After allowing enough time for consideration, one of the staff members would visit the authorities to discuss the breakdown. The timing of the coordination calls is very important for best results.

Usually these visits led to a conference of several specialists in the organization visited. When a number of these calls have been made, a pattern for the section breakdown usually begins to form and the results of a number of calls are merged into a coordination summary.

In some cases two or more schools of thought were discovered, and then recoordination was necessary to reconcile the differences. In a few cases several recoordination operations were necessary. The SAIS staff was not content until a pattern had been developed which satisfied most of the leading contributing authorities. The resulting recommendations were not based on numerical considerations, but the qualifications and interests of each authority were carefully weighed and their contributions appraised accordingly.

SUBJECT DIVISION		SUBJECT SECTION	
No.	Title	No.	Title
1	Guided Missiles	0	General
		1	Guidance and Control
		2	Launching
		3	Propulsion
		4	Aerodynamics and Ballistics
		5	Warheads and Fuzes
		6	Ground Handling
		7	Auxiliary Equipment
		8	Structures
		9	
		10	Production
		11	Performance
		12	Design and Description
		13	Operation and Maintenance
		14	Testing
2	Aerodynamics	0	General
		1	Stability and Control
		2	Performance
		3	Control Surfaces
		4	Internal Flow
		5	Boundary Layer
		6	Wings and Airfoils
		7	Parasitic Components and Interference
		8	Aerodynamic Loads
		9	Fluid Mechanics and Aerodynamic Theory
		10	Thermoaerodynamics
3	Electronics	0	General
		1	Communications
		2	Radar
		3	Navigational Aids
		4	Static and Interference
		5	Landing Aids
		6	Electronic Controls
		7	Television
		8	Electronic Tubes
		9	Antennas
		10	Components
		11	Testing
		12	Electronic Theory
		13	Telemetering
4	Power Plants, Rocket	0	General
		1	Cooling
		2	Control
		3	Ignition
		4	Exhaust Nozzles
		5	Rocket Propulsion Theory
		6	Propellant System
		7	Accessories
		8	Combustion Chambers
		9	Installation
		10	Performance
		11	Testing
		12	Design and Description
		13	Operation and Maintenance
		14	Production
5	Power Plants, Jet and Turbine	0	General
		1	Cooling
		2	Induction System
		3	Compressors
		4	Combustion
		5	Ignition
		6	Exhaust System and Nozzles
		7	Vibration
		8	Fuel System
		9	Lubrication
		10	Accessories
		11	Control
		12	Combustion Chambers
		13	Turbines
		14	Components
		15	Installation
		16	Performance
		17	Testing
		18	Design and Description
		19	Operation and Maintenance
		20	Production
		21	Comparative Studies
		22	Compounding
6	Power Plants, Reciprocating	0	General
		1	Cooling
		2	Induction and Supercharging
		3	Combustion
		4	Ignition
		5	Exhaust System
		6	Vibration
		7	Fuel System
		8	Lubrication
		9	Accessories
		10	Control
		11	Components
		12	Installation
		13	Performance
		14	Testing
		15	Design and Description
		16	Operation and Maintenance
		17	Production
7	Structures	0	General
		1	Loads and Criteria
		2	Theory and Analysis Methods
		3	Design and Details
		4	Testing
		5	Weight Analysis and Control
		6	Stress Analysis of Specific Aircraft
		7	Structural Tests of Specific Aircraft
		8	Aeroelasticity
8	Materials	0	General
		1	Ceramics
		2	Plastics
		3	Rubber, Natural and Synthetic
		4	Wood
		5	Leather and Textiles
		6	Adhesives and Sealants
		7	Dopes, Paints and Finishes
		8	Misc. Non-Metallic Materials
		9	Iron and Alloys
		10	Aluminum and Alloys
		11	Magnesium and Alloys
		12	Misc. Non-Ferrous Metals and Alloys
		13	Powder Metallurgy
		14	Sandwich Materials
		15	
		16	Testing
9	Aircraft Instruments	0	General
		1	Engine Instruments
		2	Flight Instruments
		3	Navigation Instruments
		4	Position Indicating Devices
		5	Timing Devices
		6	Flight Test Instruments
		7	Accessory Instruments
		8	Instrument Testing and Calibration
		9	Automatic Flight Control
		10	Installation
		11	Operation and Maintenance
		12	Production
10	Airplane Design and Description	0	General
		1	Preliminary Design
		2	Wing Group
		3	Tail Group
		4	Body Group
		5	Landing Gear
		6	
		7	Cockpit and Control Cabin
		8	Control Systems
		9	Personal Airplanes
		10	Commercial Airplanes
		11	Military Airplanes
		12	
		13	Research Types and Special Configurations
		14	Historical Airplanes
11	Propellers	0	General
		1	Aerodynamics
		2	Control
		3	Pitch-changing Mechanism
		4	Components and Accessories
		5	Ice Control
		6	Installation
		7	Performance
		8	Testing
		9	Design and Description
		10	Operation and Maintenance
		11	Production
12	Fuels and Lubricants	0	General
		1	Solid Fuels
		2	Liquid Fuels
		3	Gaseous Fuels
		4	Solid Lubricants
		5	Liquid Lubricants
		6	Solid Propellants
		7	Fluid Propellants
		8	Analysis and Testing
		9	Production and Refining
		10	Storage and Distribution
		11	Standards and Specifications
13	Flight Testing	0	General
		1	Specifications and Requirements
		2	Methods and Techniques
		3	Equipment and Instrumentation
		4	Data Evaluation and Reduction
		5	Performance
		6	Handling Characteristics
		7	Propulsion Group
		8	Airplane Equipment
		9	Miscellaneous Testing
		10	Flight Tests of Specific Airplanes
14	Machine Elements	0	General
		1	Fastenings
		2	Bearings
		3	Transmissions, Clutches, and Drives
		4	Gears and Cams
		5	Mechanisms
		6	Springs
15	Flight Safety and Rescue	0	General
		1	Accident Prevention and Protection
		2	Accident Investigation and Analysis
		3	Aircraft Fires
		4	Bail-out Equipment and Procedures
		5	Forced Landings
		6	Survival and Rescue
16	Electrical Equipment	0	General
		1	Power Generating Equipment
		2	Convertors
		3	Motors and Actuators
		4	Control and Protective Equipment
		5	Distribution Equipment
		6	Lighting
		7	Heating
		8	Batteries and Storage
		9	Electrical Theory
		10	Testing
		11	Operation and Maintenance
		12	Production
17	Wind Tunnels	0	General
		1	Design and Description
		2	Calibration
		3	Equipment and Instrumentation
		4	Testing
		5	Operation and Maintenance
		6	Models
		7	Data Evaluation and Reduction
		8	Wind Tunnel Tests of Specific Aircraft
18	Thermodynamics	0	General
		1	Thermodynamic Properties
		2	Combustion
		3	Thermal Measurement and Control
		4	Heat Transfer
		5	Thermodynamic Theory
19	Aviation Medicine	0	General
		1	Flight Pathology
		2	Flight Psychology
		3	Flight Physiology
		4	Pharmacology
		5	Personnel Selection and Fitness
		6	Protective Equipment
		7	Research Equipment and Facilities
		8	Aviation Sanitation
		9	
20	Hydraulic and Pneumatic Equipment	0	General
		1	Hydraulic Systems
		2	Pneumatic Systems
		3	Power Sources
		4	Distribution Equipment
		5	Actuators and Motors
		6	Valves and Controls
		7	Components and Accessories
		8	Hydraulic Fluids
		9	Theory and Research
		10	Testing
		11	Operation and Maintenance
		12	Production
21	Water-borne Aircraft	0	General
		1	Hydrodynamic Theory
		2	Flotation
		3	Spray Control
		4	Planing
		5	Hydrofoils
		6	Stability and Control
		7	Impact
		8	Performance
		9	Testing
		10	Design and Description
		11	Ditching
		12	Operation and Maintenance
22	Ordnance and Armament	0	General
		1	Ammunition
		2	Guns
		3	Ground Handling
		4	Fire Control
		5	Armor
		6	Explosives and Propellants
		7	Bombs
		8	Bombing Systems
		9	Torpedoes and Mines
		10	Rockets and Launchers
		11	Chemicals and Incendiaries
		12	Ballistics
		13	Gun Mounts and Turrets
		14	Testing
23	Comfortization	0	General
		1	Air Conditioning
		2	Oxygen Systems
		3	Noise and Vibration Control
		4	Furnishings and Accommodations
		5	Interior Layout and Styling
		6	Lighting and Illumination
		7	Requirements and Specifications
24	Military Operations	0	General
		1	
		2	Organization and Administration
		3	Personnel and Training
		4	Intelligence
		5	Logistics
		6	Strategy and Tactics
		7	Operations
		8	Air Defense
26	Photography	0	General
		1	Aerial Photography
		2	Special Photography
		3	Still Cameras
		4	Motion Picture Cameras
		5	Sensitized Materials
		6	Processing
		7	Photogrammetry
		8	Accessory Equipment
29	Navigation	0	General
		1	Theory of Navigation
		2	Dead Reckoning and Pilotage
		3	Celestial Navigation
		4	Electronic and Automatic Navigation
		5	Special Navigation Methods
		6	Maps, Charts and Tables
		7	Navigation Instruments
30	Meteorology	0	General
		1	Practical Meteorology
		2	Atmospheric Structure and Physics
		3	Upper Air Research
		4	Radiation and Temperature
		5	Winds
		6	Aqueous Vapor and Hydrometeors
		7	Climatology
		8	Various Phenomena and Influences
		9	Equipment and Instruments
32	Underground Installations	0	General
		1	Description
		2	Site Selection
		3	Structural Design
		4	Construction Methods and Equipment
		5	Passive Defense
		6	External Transportation
		7	Internal Transportation
		8	Power
		9	Illumination
		10	Air Conditioning
		11	Water, Sewage and Drainage
		12	Machinery and Equipment
		13	Production
		14	Costing
		15	Personnel Problems
33	Sciences, General	0	General
		1	Chemistry
		2	Physics
		3	Mathematics
		4	Mechanics
		5	Biology
		6	Geography
		7	Optics
34	Rotating Wing Aircraft	0	General
		1	Aerodynamics and Performance
		2	Stability and Control
		3	Control Systems
		4	Rotor Design and Dynamics
		5	Airframe
		6	Power Plant and Drive System
		7	Accessory Equipment
		8	Special Types
		9	Testing
		10	Design and Description
		11	Operation and Maintenance
		12	Production
35	Gliders	0	General
		1	Aerodynamics and Performance
		2	Airframe and Equipment
		3	Launching and Ground Handling
		4	Operation and Maintenance
		5	Design and Description
36	Production	0	General
		1	Site Selection
		2	Plant Layout
		3	Plant Maintenance
		4	Materials Procurement and Control
		5	Materials Handling and Storage
		6	Production Engineering
		7	Tooling
		8	Fabrication Processes and Methods
		9	Assembly and Installation
		10	Modification
		11	Quality Control
37	Industrial Relations	0	General
		1	Employment Policies and Procedures
		2	Labor Relations
		3	Job Evaluation and Efficiency Rating
		4	Wage and Salary Administration
		5	Insurance and Benefits
		6	Personnel Services and Welfare
38	Education and Training	0	General
		1	Collegiate Education
		2	Technical Institute Training
		3	Vocational Training
		4	Flight Training
		5	Training-in-Industry
		6	Air-Age Education
		7	Airline and Commercial Training
39	Airports and Airways	0	General
		1	Airport Planning
		2	Airfield Design and Construction
		3	Seaplane Bases
		4	Buildings and Facilities
		5	Lighting Equipment
		6	Airport Traffic Control and Landing Aids
		7	Airport Management and Operation
		8	Airport Maintenance
		9	Airways
41	Air Transportation	0	General
		1	Scheduled Airline Operations
		2	Irregular Airline Operations
		3	Cargo and Express Operations
		4	Air Mail and Air Parcel Post
		5	International Operations
		6	Fixed-Base and Miscellaneous Operations
		7	Economics of Air Transportation
		8	Maintenance
46	Organizations and Societies	0	General
		1	Technical and Scientific Societies
		2	Trade Associations
		3	Pilot and Users Associations
		4	Promotional and Educational Societies
		5	Government Agencies
		6	Employee Associations
47	Aeronautics, General	0	General
		1	Bibliographies
		2	Dictionaries and Encyclopedias
		3	Directories
		4	Yearbooks
		5	Handbooks
		6	History and Records
		7	Biography
		8	Literature
48	Atomic Energy	0	General
		1	Nuclei
		2	Fission and Fission Products
		3	Radioactivity and Radiation
		4	Isotope Separation
		5	Reactors
		6	Instruments and Techniques
		7	Health and Safety
		8	Aeronautical Applications
		9	Nonaeronautical Applications
49	Engineering Practices	0	General
		1	Drafting and Lofting
		2	Reproduction Methods
		3	Information and Records
		4	Computers and Calculators
		5	Standardization

Fig. 1 - SAIS Divisions and Sections

As soon as each breakdown was crystallized, the section headings (Fig. 1) and their terminology and scope were presented, and the comments of the authorities were condensed in a coordination summary for presentation at periodic conferences with the representatives of the Central Air Documents Office. At these conferences, the accumulated coordination summaries were carefully discussed in the light of the use of the recommended breakdown for the dissemination program of the Air Technical Index. Sometimes these discussions resulted in necessary compromises. Wherever possible the authoritative consensus was accepted or modified as little as possible to obtain conformance with Air Technical Index requirements. At this point it should be mentioned that these conferences, although strenuous, were most satisfactory because of the willingness of the ADD representatives to accept the recommendations of the authorities.

As the coordination of the section headings for the SAIS has progressed, the breakdowns have been tested in the dissemination program of the Air Technical Index. As might be expected, certain modifications in the scope of the sections have been indicated by their use in mass processing of documents. These changes have been discussed in a recent CADO-SAIS Conference.

During all of this activity, subject headings for the sections of the SAIS have been in the process of creation at Wright Field. Daily conferences between members of the CADO and the Dayton representative of the SAIS have resulted in the tentative creation of thousands of subject headings tailored to the thousands of documents which have been flowing through the CADO pipeline.

These subject headings are now being merged with those created by the Special Libraries Association and with other important subject heading lists. This work is being done by routine methods and the result will be the full structure of the SAIS.

Mr. Thorne

The Dayton representative of the SAIS serves as a liaison agent between the Institute of the Aeronautical Sciences and the Central Air Documents Office in the coordination of the SAIS and serves as a member of the CADO Subject Heading Committee.

The Subject Heading Committee reviews documents being processed in the ATI and establishes standard and technically accurate subject headings which will reflect the contents of the documents. Before establishing these subject headings, the Committee reviews existing subject heading lists of the National Advisory Committee for Aeronautics, of the Office of Naval Research, and of other agencies who have published subject heading lists in the various fields of science and engineering. First, the Committee attempts to use a heading already in existence. If one cannot be found, the Committee reviews the documents and proposes a number of suitable headings. These headings are coordinated with specialists of the Engineering Division, Air Materiel Command, in the field involved. Further coordination is necessary to insure that the new headings conform to standard library practices. The Committee is responsible, too, for establishing the headings in the language of those engineers by whom the documents will be used, inasmuch as the subject headings are the only means by which a document can be located.

In the development of the SAIS, the Dayton representative is responsible for coordination with authorities at AMC in major fields of interest as established. These specialists are requested to present their views on how a specific subject should be covered and on how much detail should be used by the system in covering the subject. From the pattern evolved as the result of this research, tentative subject headings are established. The same type of coordination is maintained with nearby engineering and manufacturing concerns.

The recommendations of these military and industrial authorities are compiled in a coordination report and forwarded to the Director of the SAIS for national coordination.

Mr. Woodham

The establishing of subject divisions and sections for the SAIS on a national scale requires extensive coordination. The initial step in this coordination is the assigning of a division to a staff member of the SAIS. The staff member makes a literature search of all the available material in the field through the facilities of the IAS. As a result of this search, a breakdown of the field is compiled and submitted to specialists in the industry who have agreed to cooperate on the project. The Dayton representative also discusses the headings with appropriate divisions and sections at the Air Materiel Command. Certain cooperating agencies such as the NACA, CAA, Bureau of Aeronautics, Office of Naval Research, Special Libraries Association, Aircraft Industries Association, and others have also been contacted on each division. In many instances, coordination was accomplished by personal interview. An analysis of the opinions expressed by these authorities helps to determine the eventual sections which will be established. However, if there is a certain amount of disagreement, further study and coordination are necessary.

A report listing the proposed section headings which have been established to the satisfaction of those concerned is submitted to CADO for study to determine whether the sections meet operating requirements of the Air Force and Navy. Included in the list are notes for each of the sections which indicate their scope. Approval by CADO of the list coordinated through industry and government results in accepted section headings.

Mr. Smith

Application of the SAIS to reviews of current articles and reports and to books was begun by the Institute of the Aeronautical Sciences in the January 1948 issue of the Aeronautical Engineering Review. The first annual Aeronautical Engineering Index, covering the year 1947, gathered the reviews of the twelve monthly issues of the Aeronautical Engineering Review into one volume, arranged according to the divisional and sectional breakdowns established by the SAIS.

The use of SAIS in these publications has provided a basis for the discussion of problems arising during its development and has demonstrated the practical value of SAIS as applied to published technical information. The requirement in the annual Aeronautical Engineering Index for a more detailed breakdown than is needed in the monthly issues of the Review led to the utilization of most of the sections of SAIS. There appears to be substantial agreement in the demands made upon SAIS in this application as compared with the demands made upon SAIS in the cataloging and distribution of documents and other specialized material.

Difficulties encountered in the use of SAIS in the Aeronautical Engineering Index were largely those of undertaking a new publication. Acquaintance with SAIS and greater familiarity with the mechanical problems of compilation have considerably decreased the time needed for the work, which is proceeding smoothly at present on a month-to-month basis. The Index for 1948 was published in February, 1949. It is expected that the Index for 1949 will be published as early or even earlier in 1950.

DISCUSSION

Col A. A. Arnhym: CADO

I would like to emphasize that the primary interest of CADO in having the SAIS coordinated by the Institute of the Aeronautical Sciences was to obtain a functional breakdown or distribution guide for the dissemination of classified documents, on a selective basis, to agencies and contractors of the Armed Forces. If and when applicable, the same breakdown is being used by CADO and a number of other organizations for indexing purposes.

Mr. Walter J. Granfield: Minneapolis-Honeywell Regulator Co.

If an organization requests documents from CADO pertaining to a specific subject section of the SAIS, will it automatically receive documents listed under related subject sections?

Col A. A. Arnhym: CADO

Distribution of documents can be made only in the divisions and sections which have been specifically approved. If the requestor feels that he does not get all of the material which is pertinent to his contract or field of endeavor, he must take the necessary steps to be included in the distribution list for those additional subject divisions and sections which he feels are required for his work. Further details of this subject will be discussed in subsequent panels.

Mr. L. P. Bradley: McDonnell Aircraft Corp.

How complete is the breakdown of the SAIS?

Col A. A. Arnhym: CADO

The subject division breakdown of the SAIS is complete to all purposes although it may be necessary from time to time to add new divisions if the scope of the Air Technical Index is expanded. The section breakdown for these divisions is about 90% complete and will be completed during the next few weeks.

Mr. L. P. Bradley: McDonnell Aircraft Corp.

What about the subject headings?

Mr. L. E. Neville: SAIS

A list of approximately 15,000 proposed subject headings has been submitted by CADO to the staff of the SAIS and will be coordinated by the latter on a national basis. It will be published in alphabetical arrangement in about four months.

Mr. L. P. Bradley: McDonnell Aircraft Corp.

Will this alphabetical listing of subject headings show the SAIS divisions and sections to which they pertain?

Col A. A. Arnhym CADO

Behind every subject heading will be listed the SAIS subject division(s) and section(s) to which they pertain.

THE AIR TECHNICAL INDEX

Panel Chairman:	**Mr. Eugene B. Jackson**	**Civilian Chief, Document Requirements Section, CADO**
Members:	**Maj William A. Barden**	**Assistant Director (AF), CADO**
	Capt Michael Zubon	**Chief, Document Processing Section, CADO**
	Mr. George H. Rogge, Jr.	**Chief, Technical Data Digest Section, CADO**

Mr. Jackson

One of the most commonly accepted truths among research workers is that the mass of information being brought out today in the form of reports is almost beyond human comprehension. As Dr. Vannevar Bush expressed it:

> "The (scientific) investigator is staggered by the findings and conclusions of thousands of other workers - - conclusions which he cannot find time to grasp, much less to remember, as they appear . . . ."

In connection with research work done by the National Military Establishment and its component services, the difficulty of finding information is further complicated by the military security program. A document or a piece of equipment may be designated as "Restricted," "Confidential," "Secret," or "Top Secret" depending upon the harm that would be done to our country by the revelation of the information to an enemy or to a potential enemy. It is believed that originally these so-called classifications were developed to protect tactical, strategic, and diplomatic messages, codes, and papers where the prime consideration was the necessity of denying knowledge of information contained therein to a potential opponent. Accordingly, the directives promulgated by the military services have been based primarily on the needs of the above types of documentary material. However, it is coming to the attention of personnel concerned with the military documentation program that scientific material is being unduly shackled by the imposition of classifications intended for another type of material. To make the distinction somewhat clearer, it is quite possible that plans which were made for the invasion of Japan have, and will continue to have, a high security classification because geographic factors and similar information do not change sufficiently to warrant scrapping of plans made some time ago. On the other hand, if a classification "Secret" were placed on a document concerning vacuum tubes, it is quite possible that within six months or less the same information could be found in a commercially published periodical in the field of electronics, and the security classification of "Secret" on the original document would then be quite meaningless. It was quite logical when strategic and tactical documents were involved to have the originator be the sole arbiter regarding a possible downgrading or lowering of classification in connection with the document he had originated. On the other hand, it is using questionable judgment to reserve to the originator of a technical document the exclusive right for all time to control the security classification of his report. Personnel conversant with the state of development in a particular scientific field should be, perhaps, more qualified to judge the necessity for revision of the classification originally assigned. This is emphasized by mention of the fact that CADO has literally hundreds of documents in its collection that it believes are overclassified but which cannot be downgraded now because that agency which prepared the report is no longer in existence. While CADO believes that proper measures should be taken to protect the national interest, it still believes that the existing military classification directives impose a tremendous obstacle to its avowed purpose of disseminating technical information. It further feels that consideration might well be given to

the ultimate establishment of a separate set of security regulations outlining procedures, policies, and doctrines for the handling of technical information and including a new set of classifications designed to replace the presently existing terms of "Restricted," "Confidential," etc. Pending the development of the additional procedures outlined above, an authorization for CADO to establish a board of officers to consider the downgrading of scientific reports would be most helpful.

That the dissemination of technical information is an important matter is emphasized in a report prepared by the Special Committee on Technical Information of the Research and Development Board which reads in part:

"Technical information must be disseminated promptly to research workers and organized for future reference and as a source of inspiration for new ideas.

"Present activities in this field consist mainly of production operations -- preparing, distributing, and cataloging reports and abstracts. The limited amount of research and development in this field is directed toward the solution of immediate problems which arise in these operations. What is needed is a bold and basic attack.

"Each research and development project yields technical information -- a report, or several reports -- which should be placed as promptly as possible in the hands of other research workers in the same or in allied fields. The new information must also be assimilated into the existing mass of technical information and correlated with similar material in order that it may be readily available for future reference. This is essential to provide an organized background for selecting fields for further exploration. A scientific advance or a technological improvement has not made its full contribution to the advancement of science or to the over-all research and development effort until it is known to all who need the information in their work. Even more important is the potential effect of well-organized information as a source of inspiration for stimulating new ideas. Improvement in the effective recording and dissemination of new information or in methods for cataloging, classifying and indexing for ready accessibility would produce definite savings in time, money and scientific man power.

"It is our continuing duty to know as much as possible about current research and development efforts outside the National Military Establishment, in this and foreign countries. A more complete and ready exchange of information with other governmental agencies, with academic and industrial organizations, and with foreign countries, together with better methods of collecting and organizing scientific intelligence, would aid materially in developing an over-all national research and development program which would make the wisest utilization of available funds and scientific man power. There is a growing awareness that our very expensive military planning must be based on accurate and organized information regarding the related activities of possible enemies.

"In many instances the only lasting result of research work is the recorded information regarding the discoveries made. This is the actual product in many cases for which the millions of dollars of research and development funds are being spent. The Committee urges that a significant portion of money being spent on research and development be allocated to the specific purpose of creating better methods of insuring that information is recorded and is organized in such a way as to be readily available. A program of research directed toward this end in the Military Establishment, in other government agencies, in universities, and in industrial establishments will increase the real value of research projects on which hundreds of millions of dollars are now being spent. Effort expended on work duplicating that done elsewhere is wasting large sums. This can be avoided only by a well-organized record of what is being done."

Perhaps the next point to be considered is: What are the sources of information? The need for the dissemination of information has been mentioned but not the types of sources for that information. Information from scientific and technical research may be found normally in classified documents, unclassified documents, periodicals, monographs, books, patents, photographs, and technical motion-picture film. These sources have been listed in the approximate order of their value in the preparation of a normal report. Classified documents would normally be the most valuable, but they have the inherent difficulty of being less widely known, less widely available, and less completely cataloged than the other types of material. Each research activity has its own file of reports that has been originated under its auspices; the local card catalog contains references to some 250,000 documents which were received at Wright Field from 1917 to the establishment of the Air Documents Division. Other sources of information might be the various accession lists of documents, various abstract publications, and bibliographies. The ATI will be considered as an additional source of information concerning classified documents. Another source is the excellent "Technical Information Pilot" of the Science and Technology Project of the Library of Congress. Unclassified documents are normally more widely known and more readily available than classified documents. However, they contain information that can be highly valuable and that might have been overlooked originally when issued in classified form. The Captured Documents Index card catalog prepared by the Air Documents Division is a source of information on 55,000 captured documents and is supplemented in this particular field by the Office of Technical Service's "Bibliography of Scientific and Industrial Reports." In addition there is a "desk catalog" published by the Air Documents Division on the same 55,000 documents using electrical accounting tabulating equipment to prepare the copy. The accession lists, abstract publications, and bibliographies mentioned previously apply to unclassified documents also. Another large body of unclassified documents is that under the bibliographical control of the Superintendent of Documents, Washington, through his "monthly catalog." Documents being discussed today differ in that they are "classified" and no depository copies are available. Periodicals normally contain material that is less recent than that appearing in unclassified documents and still less recent than that appearing in classified documents. Periodical articles, however, may summarize information that previously appeared in many different documents and normally include good bibliographies that will lead to other reports on the subject. Periodical indexes make this material more readily available as well as do abstract journals. The CADO TECHNICAL DATA DIGEST is an example of an abstract journal in the field of aeronautics.

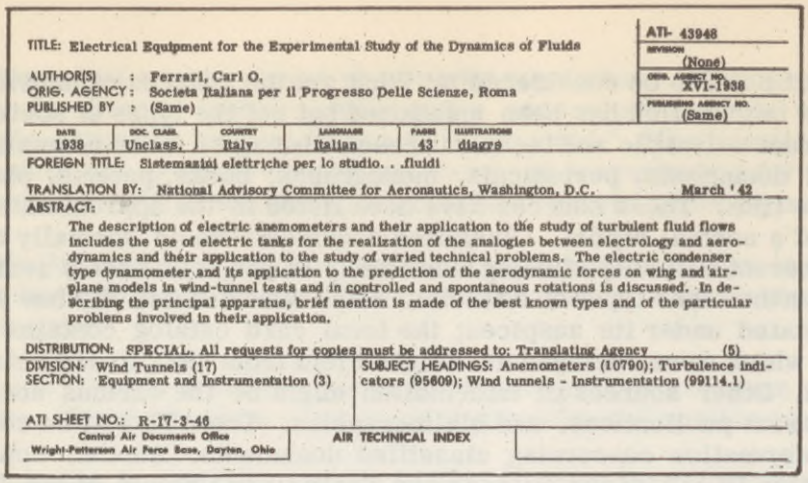
Books normally contain less recent material than that included in periodicals or documents, but the material that is included therein is still further summarized over that which appeared in other forms and is good for background material not otherwise readily available.

Patents are inconvenient materials with which to work but are valuable sources of information. Fortunately CADO has had nothing to do with the patent picture as yet!

Photographs and motion-picture films need no further discussion.

There is an awareness of the mass of information available, of the need for research workers keeping abreast of developments in their fields, of the effect of security classifications on dissemination, and of the importance of information contained in classified documents when considered and contrasted in timeliness and value with information obtainable from other sources.

The ATI may be defined as a service designed to catalog and index air technical material and to announce its availability on a selected basis to qualified aeronautical and allied activities which participate directly or indirectly in the National Research and Development Program. In other words, it is a documentation instrument designed to announce the existence of scientific and technical documents possessing military security classifications without violating requirements for national security.



TITLE: Electrical Equipment for the Experimental Study of the Dynamics of Fluids

ATI- 43948

DIVISION: (None)

AUTHOR(S) : Ferrari, Carl O.
ORIG. AGENCY: Societa Italiana per il Progresso Delle Scienze, Roma
PUBLISHED BY : (Same)

ORIG. AGENCY NO.: XVI-1938

PUBLISHING AGENCY NO.: (Same)

DATE	DOC. CLASS.	COUNTRY	LANGUAGE	PAGES	ILLUSTRATIONS
1938	Unclass.	Italy	Italian	43	diagrs

FOREIGN TITLE: Sistemazioni elettriche per lo studio. . .fluidi

TRANSLATION BY: National Advisory Committee for Aeronautics, Washington, D.C. March '42

ABSTRACT:

The description of electric anemometers and their application to the study of turbulent fluid flows includes the use of electric tanks for the realization of the analogies between electrology and aerodynamics and their application to the study of varied technical problems. The electric condenser type dynamometer and its application to the prediction of the aerodynamic forces on wing and airplane models in wind-tunnel tests and in controlled and spontaneous rotations is discussed. In describing the principal apparatus, brief mention is made of the best known types and of the particular problems involved in their application.

DISTRIBUTION: SPECIAL. All requests for copies must be addressed to: Translating Agency (5)

DIVISION: Wind Tunnels (17)
SECTION: Equipment and Instrumentation (3)

SUBJECT HEADINGS: Anemometers (10790); Turbulence indicators (95609); Wind tunnels - Instrumentation (99114.1)

ATI SHEET NO.: R-17-3-46

Central Air Documents Office
Wright-Patterson Air Force Base, Dayton, Ohio

AIR TECHNICAL INDEX

Fig. 2 - ATItem

Maj Barden

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The distribution note indicates if and where the user can get copies of the report. The note is very important since some documents may be secured only from the originating agency. Others must be requested through a cognizant agency for approval before CADO can supply copies, and, in other instances, only government agencies or military organizations can secure copies of the report involved.

The SAIS subject division and section indicates the general field of interest into which the document falls. The subject headings, under which the document was specifically cataloged, covers details of the document. The SAIS subject division and section are useful for selective distribution in the announcements of the existence of a document, and the subject headings are useful in locating a specific document. The contract number of the report indicates whether the work was accomplished under government contract.

CADO considers this information to be pertinent in properly cataloging the material included in the ATI. The author, originating agency, publishing agency, subject headings, and contract numbers are all possible approaches to specific documents.

*** It is desired to maintain a card catalog, the transparency should be reproduced on card-stock which is then cut into individual cards. Sufficient ~~ copies should be made to permit cross-referencing by title, author, originating agency series and the cross-references suggested on the cards. (The numbers following each cross-reference refer to automatic machine records).

*** Unless a distribution notice stating otherwise is included on the catalog card, microfilm or, when available, printed copies of the documents listed on this sheet can be obtained by addressing your request to: Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio. Attention: Air Documents Division, MCIDXD. Each request should include title, author, originating agency as well as ATI number of the document. Commercial organizations may receive ATI sheets and documents only, if they have been cleared by their contracting agency and Service to receive material of that particular subject and security classification.

RESTRICTED

TITLE: Wind-Tunnel Balance System

AUTHOR(S) : Saxon, R. J.
ORIG. AGENCY : University of Michigan, Ypsilanti, Mich.
PUBLISHED BY : (Same)

ATI- 34899
REVISION: (None)
ORIG. AGENCY NO.: EMC-3
PUBLISHING AGENCY NO.: (Same)

DATE	DOC. CLASS.	COUNTRY	LANGUAGE	PAGES	ILLUSTRATIONS
March '48	Restr.	U.S.	English	12	diagrs

ABSTRACT:

Deflection vs time curves indicate the action of the present vertical wind-tunnel balance system dampers which are used to decrease the relaxation time of the oscillations induced by the dynamic application of the air loads to the model. The oscillations from the original shock are damped out in all cases in about 7 seconds. The higher frequency ripple (about 15 cps) is particularly noticeable in the higher load ranges. This is introduced through the base of the beam gage from the supporting structure and, as such, is not damped by dash pots. Unless suitable precautions are taken, exciting oscillations from outside sources, motors, vacuum pumps, etc., will probably cause objectionable ripples in the recorded data.

DISTRIBUTION: Copies of this report obtainable from CADO. (1)

DIVISION: Wind Tunnels (17)
SECTION: Equipment and Instrumentation (3)

SUBJECT HEADINGS: Wind tunnels - Balances (99110)

ATI SHEET NO.: R-17-3-46

Central Air Documents Office, Wright-Patterson Air Force Base, Dayton, Ohio

AIR TECHNICAL INDEX

RESTRICTED

TITLE: The Silent Dark Current Discharge in Air at Atmospheric Pressure and Its Anemometrical Application

AUTHOR(S) : Fucks, Wilhelm
ORIG. AGENCY : Deutsche Versuchsanstalt fuer Luftfahrt, E.V.
PUBLISHED BY : Zentrale fuer wissenschaftliches Berichtswesen, Berlin-Adlershof

ATI- 45549
REVISION: (None)
ORIG. AGENCY NO.: (None)
PUBLISHING AGENCY NO.: UM-1205

DATE	DOC. CLASS.	COUNTRY	LANGUAGE	PAGES	ILLUSTRATIONS
April '44	Unclass.	Germany	German	35	photos, graphs

FOREIGN TITLE: Ueber die stille Vorentladung in Luft von Atmosphaerendruck. . .Verwendung

TRANSLATION BY: National Research Council of Canada, Ottawa Sept '48

ABSTRACT:

The silent dark current discharge in air at atmospheric pressure is investigated to determine its suitability for measuring flow velocities of gases. The question of transition from the Townsend discharge into the silent dark discharge is discussed. The range of the discharge which lies between the initial voltage and the ignition voltage of the glow discharge is determined as a function of the relevant parameters. The effect of an air current is ascertained by recording a field of flow characteristics from which the anemometric sensitivity of the apparatus is calculated. A detailed summary of the results, illustrated by graphs, is given.

DISTRIBUTION: Copies of this report obtainable from CADO. (1)

DIVISION: Wind Tunnels (17)
SECTION: Equipment and Instrumentation (3)

SUBJECT HEADINGS: Anemometers, Leakage current (10800); Wind tunnels testing - Procedures (99103)

ATI SHEET NO.: R-17-3-46

Central Air Documents Office, Wright-Patterson Air Force Base, Dayton, Ohio

AIR TECHNICAL INDEX

Previously cataloged as Captured Document No. ZWB/UM/Re/1205

TITLE: New Interference Phenomena in the Schlieren System

AUTHOR(S) : Gayhart, E. L.; Prescott, Rochelle
ORIG. AGENCY : Johns Hopkins University, Silver Spring, Md.
PUBLISHED BY : USN Contract No. NOrd-7386

ATI- 48514
REVISION: (None)
ORIG. AGENCY NO.: APL/JHU/CM-513
PUBLISHING AGENCY NO.: (None)

DATE	DOC. CLASS.	COUNTRY	LANGUAGE	PAGES	ILLUSTRATIONS
Jan '49	Unclass.	U.S.	English	13	photos, tables, graphs, drwg

ABSTRACT:

A diffraction phenomena has been discovered in the Schlieren system which makes possible a quantitative Schlieren method. In this method bands are observed in the Schlieren field. These bands represent regions in the Schlieren through which the optical path length is constant and different from the Schlieren free portion of the field by (N + 1/2) wavelengths of the light used (where N represents an integer). It has been demonstrated that, within the experimental accuracy, these bands have the same meaning as those observed in the Mach-Zender type of interferometer when that instrument is adjusted so that one fringe covers the entire field.

DISTRIBUTION: Copies of this report obtainable from CADO. (1)

DIVISION: Wind Tunnels (17)
SECTION: Equipment and Instrumentation (3)

SUBJECT HEADINGS: Photography, Schlieren (70658); Interferometers (52701); Optical interference (68401.34)

ATI SHEET NO.: R-17-3-46

Central Air Documents Office, Wright-Patterson Air Force Base, Dayton, Ohio

AIR TECHNICAL INDEX

USN Contract N, NOrd-7386

TITLE: An Aerodynamic Balance System for a High-Speed Wind Tunnel

AUTHOR(S) : Kohlhaas, B.
ORIG. AGENCY : Luftforschungsanstalt, Muenchen
PUBLISHED BY : (Not known)

ATI- 43924
REVISION: (None)
ORIG. AGENCY NO.: (None)
PUBLISHING AGENCY NO.: (None)

DATE	DOC. CLASS.	COUNTRY	LANGUAGE	PAGES	ILLUSTRATIONS
June '46	Unclass.	Germany	German	40	diagrs, graphs

FOREIGN TITLE: Die aerodynamische Messwaage fuer einem Hochgeschwindigkeits - Windkanal

TRANSLATION BY: CADO, Wright-Patterson Air Force Base, Dayton, O.

ABSTRACT:

An aerodynamic balance was to have been constructed for a high-speed wind tunnel having a throat diameter of 3 m and in which wind velocities up to the velocity of sound were to be reached. The balance was to permit measurement of the air pressures and aerodynamic moments acting on the model suspended in the test section. The aerodynamic moments were to be measured directly and separately from the air pressures without additional computations. All values were to be teletransmitted to an instrument panel. The balance design was not completed though sufficient engineering had been accomplished to be of value to the contractors in the United States.

DISTRIBUTION: Copies of this report obtainable from CADO. (1)

DIVISION: Wind Tunnels (17)
SECTION: Equipment and Instrumentation (3)

SUBJECT HEADINGS: Wind tunnels - Balances (99110); Wind tunnels - Transonic (99131.7); Wind tunnels - Germany (99113.7)

ATI SHEET NO.: R-17-3-46

Central Air Documents Office, Wright-Patterson Air Force Base, Dayton, Ohio

AIR TECHNICAL INDEX

TITLE: Electric Thermal Air Flow Meter

AUTHOR(S) : Bennett, M. A.
ORIG. AGENCY : Engineering Division, Air Materiel Command
PUBLISHED BY : Air Materiel Command, Wright-Patterson Air Force Base, Dayton, O.

ATI- 34233
REVISION: (None)
ORIG. AGENCY NO.: (None)
PUBLISHING AGENCY NO.: AFTR-5719

DATE	DOC. CLASS.	COUNTRY	LANGUAGE	PAGES	ILLUSTRATIONS
Aug '48	Unclass.	U.S.	English	24	photos, graphs

ABSTRACT:

An electric thermal air flow meter is under development. Because of the difficulty encountered in measuring large flow rates, particularly at sonic or supersonic velocities, hot wire methods previously attempted have been abandoned. It was decided to approach the problem by permitting the wire resistance to vary with air flow and measure the resistance change of the wire or the voltage drop across the wire. Basically the system consists of a grid composed of high tensile strength, high coefficient wire which can be placed in an air stream and be heated from a constant potential DC source. A DC amplifier and electronic voltmeter are used to provide a voltage reading which is proportional to the drop across the grid. The discussion is supplemented by photographs, diagrams, and charts.

DISTRIBUTION: Copies of this report obtainable from CADO. (1)

DIVISION: Wind Tunnels (17)
SECTION: Equipment and Instrumentation (3)

SUBJECT HEADINGS: Anemometers, Hot wire (10795)

ATI SHEET NO.: R-17-3-46

Central Air Documents Office, Wright-Patterson Air Force Base, Dayton, Ohio

AIR TECHNICAL INDEX

TITLE: Electrical Equipment for the Experimental Study of the Dynamics of Fluids

AUTHOR(S) : Ferrari, Carl O.
ORIG. AGENCY : Societa Italiana per il Progresso Delle Scienze, Roma
PUBLISHED BY : (Same)

ATI- 43948
REVISION: (None)
ORIG. AGENCY NO.: XVI-1938
PUBLISHING AGENCY NO.: (Same)

DATE	DOC. CLASS.	COUNTRY	LANGUAGE	PAGES	ILLUSTRATIONS
1938	Unclass.	Italy	Italian	43	diagrs

FOREIGN TITLE: Sistemazini elettriche per lo studio. . .fluidi

TRANSLATION BY: National Advisory Committee for Aeronautics, Washington, D.C. March '48

ABSTRACT:

The description of electric anemometers and their application to the study of turbulent fluid flows includes the use of electric tanks for the realization of the analogies between electrology and aerodynamics and their application to the study of varied technical problems. The electric condenser type dynamometer and its application to the prediction of the aerodynamic forces on wing and airplane models in wind-tunnel tests and in controlled and spontaneous rotations is discussed. In describing the principal apparatus, brief mention is made of the best known types and of the particular problems involved in their application.

DISTRIBUTION: SPECIAL. All requests for copies must be addressed to: Translating Agency (5)

DIVISION: Wind Tunnels (17)
SECTION: Equipment and Instrumentation (3)

SUBJECT HEADINGS: Anemometers (10790); Turbulence indicators (95609); Wind tunnels - Instrumentation (99114.1)

ATI SHEET NO.: R-17-3-46

Central Air Documents Office, Wright-Patterson Air Force Base, Dayton, Ohio

AIR TECHNICAL INDEX

NOTE: Each sheet of the AIR TECHNICAL INDEX lists six documents all of which fall into the same military security classification, subject division and subject section. To file these sheets in proper order, it is necessary to observe the sheet number which appears in the upper right-hand corner of the sheet. This number is composed as follows: The letters "R", "C" or "S" designate the security classification (restricted, confidential or secret). The numbers following pertain to the subject division, such as "Guided Missiles" (1) or "Aerodynamics" (2). The next number or numbers refer to the subject section within that division such as "Guidance and Control" (1) or "Warheads and Fuzes" (5). The last figure is the sequence number of the sheet in each series of identical classification, division and section. Each series should be filed by itself for more convenient reference.

*** The transparency may be reproduced by any of the existing reproduction processes so that copies can be furnished to other parties in your organization. However, attention is directed to the need for compliance with security regulations pertaining to classified material.

MCI Form 71 - Revised 12 May 1948

Fig. 3 - ATI Sheet

Capt Zubon

Announcement of the availability of documents is made to qualified agencies in the form of either the ATI translucent sheets (Fig. 3) or printed card stock. Each sheet, which is divided into six sections similar to library catalog cards, contains data on six documents.

The documents listed on an ATI sheet are selected within the same military security classification such as "Restricted," "Confidential," or "Secret" and within the same division and section of the SAIS. This procedure facilitates distribution according to classification and to fields of interest so that the six documents listed on the Air Technical Index sheet can be sent to a contractor who has entered into a security agreement with the Armed Forces to receive certain classifications and who has approved to receive specific SAIS subject divisions and sections.

The method of distribution is dependent upon the purpose for which the index is to be used. If the ATI sheets are for reference only and are to be filed in a loose-leaf binder, the translucent sheet is recommended.

To file these sheets in proper order, it is necessary to observe the sheet number which appears in the upper right-hand corner of the sheet. This number is composed of the following: the letter designating the security classification, the first number indicating the subject division, the next number referring to the subject section within that division, and the last figure which is the sequence number of the sheet in each series.

While easier and quicker to file, this method lacks the flexibility of a card catalog as the information is more difficult to find.

Mr. Rogge

In discussing the Air Technical Index, it is fitting to mention the TECHNICAL DATA DIGEST which we consider as a complement to the ATI inasmuch as the latter accessions classified material while the former provides a somewhat similar service with respect to unclassified published material.

The DIGEST consists essentially of the following:

1. A "Message" contributed by a person prominent in civilian or military aeronautics and aviation. The purpose of this message is to give the readers of the DIGEST an indication of the thinking and planning of the men who prepare the future of aeronautics in this country.

2. The "Notes Section" which includes information on new developments, new materials, and new projects in connection with the aeronautical phase of the National Research and Development Program. This material is supplied by the Public Information Offices of the Armed Forces and is featured as a brief summary of data available for publication.

3. A "Feature" which is a full-length article written by scientists and engineers of the Armed Forces and is intended to give an indication of the type and scope of work undertaken in behalf of military aeronautics.

4. The "Abstract Section" which takes in the main body of the publication.

In selecting the most suitable type of abstract, certain considerations were applied. There was a choice between the "informative" abstract which is actually a digest or summary and the "directive" abstract which is rather brief and supplies only the following data:

a. What is the article about?

b. What is the scope of the article?

c. What are the considerations reached?

It is this latter type of abstract which has been selected for the TECHNICAL DATA DIGEST inasmuch as it is intended to supply only enough information to the reader to decide whether he wants to read the entire article or paper or not.

We have received numerous inquiries as to why we use the present size abstract which is not the conventional library card size. This particular size has been selected in order to permit the listing of the greatest possible number of abstracts per page and yet not reduce the printing below the size required for convenient reading. A number of agencies including ourselves cut out these abstracts and paste them on blank 3 x 5 inch cards filing them by SAIS divisions. Plans are under consideration to print abstracts on both sides instead of on one side, as is being done now, and to supply normal size cards to those agencies which decide to file these cards. I would like to emphasize that this plan is only under consideration and has not yet been implemented.

Abstracts for the TECHNICAL DATA DIGEST are acquired from two sources:

a. From publishers and engineering societies who submit abstracts in advance of the publication of the article or paper or, if they do not have the facilities to provide such abstracts, tear sheets, etc. This is done in order to be able to publish the abstract of an article or paper at approximately the same time that the article or paper is published. In this way, our abstract section is very much up to date and that much more valuable to the readers. We are very much indebted to the over 100 publishers and societies who have voluntarily contributed to this program.

b. From a field source of approximately 1000 periodicals and magazines - mainly from foreign countries - which are reviewed by our own personnel. In case we find articles considered to be of particular interest to our readers we abstract these articles ourselves. I might mention that copies of the subject abstracts are sent to the publishers with a request to join our list of contributors, and I would like to take this occasion to ask all representatives of organizations which have house organs and similar publications containing articles of broad air technical interest to share in this valuable program. In this connection, it should be mentioned that last year for the first time we published a complete index of all papers and articles which had been abstracted in the twenty-four 1948 issues of the TECHNICAL DATA DIGEST. The index has been distributed to all agencies on the distribution list of the DIGEST. This publication has met with so much approval, especially by parties who are not in a position to maintain a card index of digest abstracts, that we have decided to publish an index every six months. The index, and for that matter, the TECHNICAL DATA DIGEST is available to all agencies, organizations, and activities participating in the research and development program of the National Military Establishment.

Capt Zubon

The sources of air technical documents can be roughly categorized as Government agencies, industry, educational institutions, research institutions, and Arms and Services of the Military Establishment.

These documents are received and logged by the Acquisition Branch. From here the documents are routed to the Document Processing Section. At this point, other documents are received directly from projects at AMC. The first step in processing is the elimination of duplicate documents. Each document acquired is checked to see if it duplicates a document previously processed. Experience has shown that more than 50% of all documents received are duplicates of documents already cataloged.

This duplicate check is made against a file whose material is arranged according to originating agencies and to publishing agencies. Catalog cards are filed according to the numbers assigned to the documents by the office of origin. For example, if a document is originated by the Massachusetts Institute of Technology and sponsored by the Office of Scientific Research and Development, each of which has assigned an identifying number, a card is made for each agency and filed by its respective number. If the check is negative, the document can be further checked against the author file to eliminate probability of error. The author file is utilized for those documents which do not clearly indicate the office of origin. If the check against the author file is negative also, the document is accepted for further processing by the Reading Panel. When it is established that the document is a duplicate, the duplicate ATI Number is marked on the document, and the document is placed in stock where it is utilized to satisfy requests - thus providing paper copies instead of microfilm.

After the elimination of duplicates, remaining documents are checked in a Reading Panel, which is composed of qualified engineers. These engineers analyze the documents to determine if they are of general air interest, that is, if they are pertinent to the aeronautical phase of the National Research and Development Program. If a document is considered to be of value, it is assigned to a division and section of the SAIS to provide a means of selective announcement and distribution. Valueless and incomplete documents are culled and burned under supervision of the Security Office. The Reading Panel also determines which documents are non-ATI. The following are items which are considered as having no technical interest:

Published books available from the open market

General publications of the Military Services which are distributed in quantity and available to the Services upon request

Commercial periodicals readily available from the open market

Photos, drafts, drawings, etc., not part of a complete document

Business correspondence

Intelligence reports of tactical and/or strategic interest

Reports, which due to age, are of historical interest only

Approximately 75% of acquired documents are eliminated since 50% are found to be duplicates and 25% not of general air interest.

Documents are next examined to record standardized cataloging information (Title, Author, Office of Origin, Number of Pages, Features, etc.). The information is entered on a ditto master form. The ditto master is used to make the necessary processing and control forms - Author and OA cards for the duplicate check files, stock record cards for distribution purposes, and file cards for library research. All standard cards and records pertaining to the document are produced from the one master ditto.

After the cataloging data are established, the documents are reviewed for military security classification. Since many documents are believed to be overclassified, referral of these documents is made to offices having primary responsibility with recommendations for downgrading in order to effect wider distribution.

After the security check, the ATI documents are processed further whereas the non-ATI documents are routed to the library for storage. This does not mean necessarily that the non-ATI documents are completely buried; file cards are maintained on each document. On occasion, when requests are received for documents which have been put in this category, the documents are made ATI, processed completely, and the request filled.

Based on the field of interest, the documents are next assigned to abstractors qualified in their respective fields. An abstractor prepares a short summary of the document which includes a statement of the subject of the document, of its scope, and of the author's results and conclusions. The abstractor does not analyze or evaluate the document.

After the abstracts are accomplished, subject headings are selected. These subject headings, which are merely descriptive titles established within CADO, are the key to the establishment and use of a subject card file.

After the application of the subject headings, the processing form contains all the information necessary for the preparation of a reproducible copy of the ATI Catalog Card.

A copy suitable for reproduction by photo-offset printing is typed, and six catalog cards within the same field of interest and of the same security classification are arranged on a layout. This layout is sent to printing, and the printed sheets are distributed to authorized recipients. The document and its processing form, which contains a carbon of the final catalog card on its reverse side, is forwarded for microfilming.

The document is microfilmed page by page, preceded by a standard CADO frame, an espionage notice, and the carbon of the catalog card. The microfilm is then filed. When requests for documents are received, the master microfilm can be duplicated in a matter of minutes.

After being microfilmed, the document is forwarded to the Library where it is filed in ATI Number sequence. It is then available to any activity of this headquarters for any authorized purpose.

Maj Barden

The document request line operates in the following manner:

When a request is received in the Document Requirements Section, a validity check is made to determine, first, whether the requestor has a security clearance at least as high as the military security classification of the document requested and, second, whether the responsible project officer has approved supplying the requestor material in the SAIS subject division and section involved. If the request is determined to be valid, a request control number is assigned for record purposes.

Next an availability check is made. If the material requested has already been cataloged in the ATI, the request is forwarded to the Storage and Records Unit where the request is filled with a paper copy, if available. If no paper copy is available, the request is forwarded to the Publishing Section to determine whether a repro copy of the document is on file. If a repro copy is on file, a copy of the document is made and forwarded to the Document Requirements Section; if not, a microfilm copy is supplied - unless a paper copy is specifically requested, in which case, an Airgraph copy is made of the microfilm.

If the material requested has not been cataloged in the ATI, the request is routed to the Acquisition Branch which writes to the originating agency for the document involved. If a copy can be secured either for retention or on loan, it is cataloged in the ATI and, if distribution limitations imposed by the originating agency do not interfere, a copy of the document is forwarded to the Shipping and Receiving Branch. All the material pertaining to a specific request is controlled by the Request Control Number. Partial shipments are made, if expedient, and a hand receipt is prepared for each partial shipment. In the event CADO cannot supply material requested, the requestor is so informed giving the specific reason why the request cannot be filled.

Mr. Jackson

ATI sheets and ATI cards may both be used by reference personnel. To argue which is better, an ATI sheet or an ATI card, is somewhat analogous to deciding whether a Cadillac or a Chevrolet is the better automobile. Which of two automobiles you select depends on whether you desire luxury or economy. The purpose is the deciding factor. The Reference Unit uses both sheets and cards. Consider the case of the ATI sheets first. Each sheet has documents in the same SAIS division and section and the same military security classification. The SAIS division is a major interest in the field of aeronautical research, and the section is a minor portion of that field of interest. It may readily be seen that the sheets appearing for each division and section form a rough bibliography of a portion of a field of interest. In effect then, at present in the Reference Unit, there are "X" numbers of bibliographies accumulating. "X" is the number of sections and divisions being finalized. If a reference person then is approached by an individual who says that he wishes some material on ice control in connection with propellers but has no more definite information, the sheets in Division 11, "Propellers," and Section 5, "Ice Control," will indicate the available documents in that general field of research. Further use of the ATI sheets is for research personnel newly assigned to a field of research. The researcher, by examining the abstracts covering a certain field, may get an idea of the work being accomplished in that field and furthermore may select for detailed examination the materials that appear to him to be the most useful. At a military institution, absences from the base for extended periods of time are not unusual. In such cases, ATI sheets may be very helpful in that an individual may keep a personal record of the serial numbers of the sheets that he has examined so that on his return to duty he can examine all subsequent sheets. This procedure would be impossible if the cards were used because new cards and old cards would be interfiled. ATI sheets are also useful for helpful guidance of the Acquisition Program as they show where the weaknesses are in the subject coverage of ATI.

There are certain inherent disadvantages to having documents cataloged by personnel other than those who do the reference work with the material. When the documents are cataloged and the reference work is conducted by the same personnel, a maximum degree of familiarity with the material occurs, but a sharp curtailment of the number of documents processed results. In CADO, where so many documents have to be processed daily, it is necessary to forego that luxury and accept the cataloging of others.

Certain difficulties experienced in filing the Captured Documents Index cards were borne in mind when the ATI files were established. One expediency that was adopted was the separating of the different files in lieu of a dictionary card catalog. For simple filing, the dictionary catalog was impractical and unnecessary both when you consider filing and the reference worker's time. The most important file is the subject heading file. Five cards are allowed for setting up this file. If you desire information on the B-36, one goes to the "B" drawer. It is not necessary to look under Airplanes - Bombers or any other subject headings. One of the great advantages of the file is the facility with which code names and model designations are utilized.

Next in importance to the subject headings file is the file of the originating agencies and the publishing agencies. This file corresponds to a corporate author file and is more valuable than a personal author file in that, normally, the person knows the agency that is conducting research

work in certain fields more often than he knows the name of the individual workers. If only one or two cards are available to the user for each ATI document to which he is entitled, it is recommended that he establish an originating agency file. For ATI documents recently processed for which permanent ATI cards are not available, a single card control is established on these documents and that control is set up by originating agencies. In addition, the documents not selected for inclusion in the ATI program are assigned a serial number called a non-ATI Number and the single card control on these documents utilizes ditto cards arranged by originating agency. Formerly, permanent originating agency cards and temporary originating agency cards were filed separately. However, the process of combining the two is under way so that the temporary cards can be discarded as the permanent cards are filed. Originally no indication of the publisher was made on the ATI cards, but with the inclusion of so many OSRD documents and other such materials which were prepared by the Battelle Memorial Institute but carried an OSRD serial number, it became obviously a necessity that the card be filed by both the Battelle and the OSRD serial numbers.

Personal author files are considered next. Approximately one-half of the documents processed so far have two authors, and one-fourth have three authors. This means that three cards are needed to set up this particular file. Such a file would appear to rank behind the subject heading file and the corporate author or originating agency file. Experience does not recommend the establishment of a title file. Two cards would be needed for each set because of the considerable proportion of foreign documents in the ATI.

The next file that is maintained, but that is not recommended, is the ATI Number file. This file serves a definite purpose for CADO as an accession file of materials that should be in the stacks. As the ATI Number is merely a serial number and may be located on any subject heading card, or joint author card, or originating agency card, it is not needed in a separate file by other individuals.

Groups containing single cards for 360 documents are received together. Under the old Index Project setup, an indication was given in the lower left-hand corner of each card as to the number of cards necessary to complete a set. This is similar to the procedure used in connection with ordering printed cards from the Library of Congress. However, since the ATI cards are prepared from ATI sheets separated by division and section, it would introduce unnecessary complications to the layout personnel to continue that practice. Accordingly, CADO indulges in the somewhat wasteful habit of throwing away excess cards. It has been found that this procedure of throwing away excess cards when there are only four subject headings instead of the five allowed is a more efficient method than only receiving four cards and typing up the fifth when necessary. A total of 11 groups of cards are used - five groups for subject headings, two groups for originating agencies, three groups for personal authors, and one for the ATI Number. The item to be used in filing is underlined in red pencil on each card. After excess cards are discarded, the cards are arranged alphabetically or numerically, as the case may be, and inserted in the file. Extensive time studies have not been made in connection with this filing operation. However, a short time ago, two sets were used as an example and records were kept on the time involved in filing the 720 document cards involved. If you do not consider the cards that were later discarded, filing was accomplished at the rate of 50 cards per hour. This seems very low, but it should be remembered that some 18 separate operations are involved in placing 11 sets of cards into the ATI catalog. When that is borne in mind, the figure of 50 does not sound too low. If you do consider the cards that were later discarded, filing was done at the rate of 90 cards per hour. The method of filing outlined above uses many red pencils but definitely saves the time expended in typing required in the normal filing operation.

DISCUSSION

Johanna E. Allerding: **University of California**

Inasmuch as users of the ATI have been instructed to file the catalog cards by the originating agency, can some arrangement be made whereby the entries will be uniform?

Capt M. Zubon: **CADO**

It is realized that there is a certain amount of inconsistency in recording not only originating agencies but also authors and other entries. This is a result of the days when high speed methods were employed to catalog the captured documents, and insufficient coordination was maintained between catalogers and abstracters. Every effort is being made to coordinate our entries and obtain the greatest possible uniformity.

Johanna E. Allerding: **University of California**

Is it possible for CADO to supply ATI users with either a list of uniform entries for originating agencies, as established now and considered correct by CADO, or a set of guide cards giving these established entries?

Capt M. Zubon: **CADO**

A note will be made of this suggestion and the possibility of issuing such a list or guide cards will be investigated.

Unidentified:

Although our organization has a secrecy agreement with the Air Force, we have been notified that a branch plant located in another city cannot obtain Air Technical Index.

Col A. A. Arnhym: **CADO**

Existing regulations require that every independently operated branch of an organization accomplish a separate secrecy agreement with an agency of the Armed Forces in order to be eligible for the receipt of classified material.

Lt Col T. D. Brown: **Air University**

Can the Desk Catalog be used as a substitute for filing?

Col A. A. Arnhym: **CADO**

If you are referring to our Desk Catalog of German and Japanese Air Technical Documents, I should like to mention that this catalog contains only data on captured documents. The specialized indexes prepared for this catalog cross-refer the user to the appropriate document in the master volumes. If a file of the Captured Documents Index has not been established, it would be

advisable to use the Desk Catalog in lieu of such a file. Those items which are still of prime value were recataloged in the ATI; the catalog is a satisfactory medium for maintaining a record of the remainder.

Mr. Walter J. Granfield: Minneapolis-Honeywell Regulator Co.

Will changes in subject headings necessitate the revision of ATI cards?

Maj W. A. Barden: CADO

Corrected guide cards which will cross-reference the "old" heading to the "new" will be issued as changes are made. The cards bearing obsolete headings should be filed behind the appropriate guide cards.

Unidentified:

Is it considered helpful to establish a file by ATI Number?

Mr. E. B. Jackson: CADO

Although we maintain such a file for distribution purposes, my personal opinion is that other agencies would not find it worthwhile.

Johanna E. Allerding: University of California

I disagree with Mr. Jackson. Using agencies have found it necessary to maintain a file by ATI numbers since repeated references to the documents are made to this number only.

Carolyn J. Kruse: Naval Ordnance Test Station

NOTS has found the ATI Number file helpful in the cataloging of microfilm received from CADO.

Dr. Julian Smith: Office of Naval Research

In any mass production operation the struggle for efficiency can be ruinous to effectiveness, and CADO gives that impression. What has CADO done to increase its effectiveness?

Maj W. A. Barden: CADO

The effectiveness of the internal operations of CADO is increased by the preparation and the use of a Standard Operations Manual which explains all operations in detail and by the establishment and the maintenance of check systems to eliminate duplication of effort and to produce accurate work products. CADO is increasing its effectiveness externally by beginning the distribution of "Secret" and "Confidential" ATI sheets and by inaugurating the system of "Give-and-Take" contracts to promote the acquisition of current material.

Unidentified:

We have not completed the setting up of our file of the Captured Documents Index. What shall we do with it now since the Air Technical Index is in operation?

Col A. A. Arnhym: CADO

It had been the original intention, before the Air Technical Index was conceived, to revise the Captured Documents Index from time to time in order to eliminate incorrect and obsolete cards and to furnish additional information such as data on translations which had become available in the meantime. However, after the Air Technical Index was established, this would have been a duplication of effort and it was therefore decided to thoroughly screen all captured documents and to catalog those that were still considered to be valuable and timely in the Air Technical Index, at the same time correcting and supplementing the previous data. All catalog numbers are listed on the ATI card in order to permit references to the Captured Documents Index. If you have not yet started to set up the card index of the Captured Documents, it is suggested that you do not start doing it now, but refer to the Air Technical Index; and in case you are especially interested in a captured document, use the Desk Catalog or our latest accession list of available air technical translations. However, if you have set up the Captured Documents card index, I would very much recommend that you leave it as is and encourage your engineers in using it. We are still receiving a great many requests for copies of captured documents.

Mr. Robert E. Zarse: University of Chicago

In a conference on the principles of abstracting, it was decided that there were too many types of abstracts to settle on one form which would serve all purposes.

Mr. Dwight Gray: Research and Development Board

Research is being done in the field of abstracting to determine the most acceptable form. Questionnaires have been distributed to the appropriate agencies to determine generally how big the field of periodical literature is and what journals might be interested in an abstracting service; how many abstracting services exist; and what the interested agencies desire in their abstracts and what distribution should be made. Researchers do not seem to be interested in informative abstracts; they want to check the original document. Informative abstracts are good, however, for indexing purposes.

Mr. Walter J. Granfield: Minneapolis-Honeywell Regulator Co.

Does the Air Technical Index duplicate the TECHNICAL DATA DIGEST?

Mr. G. H. Rogge: CADO

No, it doesn't. The ATI catalogs only classified material which is not available to the general public while the TECHNICAL DATA DIGEST, in supplementing this material, abstracts only published material.

MINIATURIZATION IN DOCUMENTATION

Panel Chairman:	**Commander William H. Munson**	**Assistant Director (Navy), CADO**
Members:	**Mr. Paul R. Stauffer**	**Civilian Chief, Publishing Section, CADO**
	Mr. Roy H. Chapman	**Chief, Photo Process Branch, CADO**

Commander Munson

"To miniaturize or not to miniaturize, that is the question." Before we attempt to answer this question, let us define this newly fabricated term - miniaturization - which Webster ignores and of which Funk and Wagnalls makes no mention. CADO defines the term broadly as "the production of reduced-size copy."

Miniature copy may be obtained by at least two methods -- reduced-size printing and photographic reproduction.

Many experts do not consider reduced-size printing as falling within the scope of miniaturization. However, when facing practical problems involving cost, time, personnel, space, and equipment, both methods of size reduction - miniaturization - must be considered. First, let us pose the problem which miniaturization seeks to solve: How to reduce documentary material of all sorts to a minimum size for ease of handling, mailing, filing, and storage with a minimum sacrifice in utility. To fulfill the requirement of reduction in size is relatively simple; for example, the lyrics of "America" can be engraved on the head of this pin. But CADO does not intend for its users to do their filing on pincushions. On the contrary, CADO intends to utilize miniature forms only if that form is both practical and satisfactory to the using agencies.

To print all material in type one foot high would satisfy the readability requirement, but such reproduction would be obviously unsuitable for handling and filing. Having established the two extremes, enlarged and microscopic, the problem is to find the form which provides the best compromise between the conflicting requirements of size and utility.

Mr. Stauffer

At the present time, CADO does not have its own printing plant. It is, therefore, somewhat limited in what it can accomplish by printing methods. It does have available facilities, however, within budgetary and priority limitations, for producing a reduced-size form by either the letterpress or photo-offset method of printing. The letterpress method, which is limited to certain types of printing and which is not as flexible from the standpoint of economy as the photo-offset method, likewise can only be used with limitations in miniaturization.

Letterpress printing is accomplished by first setting the text in type either by hand or by linotype. At the present time, there are approximately 327 different type styles ranging from 4-point to 120-point size. The term "point" is used to denote the size of type. One point is approximately 1/72 of an inch. Each type style has from six to ten various type faces in each point size such as Bodoni lightface, medium, bold, ultrabold, open, book, italic, and condensed. When text is being typeset for printing, the style and size of type is governed by the size of sheet to be printed. In emphasizing a particular phrase in the text, the use of bolder type or italics is often used; underscoring or underlining accomplishes the same purpose. Four-point type is the smallest size which

is easily legible without the aid of a reading glass. Some pocket-size editions of dictionaries and Bibles are printed in 4-point type, usually lightface plain style such as Caslon, Garamond, or Century.

Letterpress is not the most practical or economical method of printing for CADO publications. CADO receives copies of reports in a wide variety of form, and reproduction of these reports in large quantities is at times necessary. Therefore, to reproduce these reports by the letterpress method would necessitate the setting of type for the text and the preparing of graphs, charts, and photographs for photoengraving plates. Photoengraving is much more expensive than photo-offset, and the end result is the same.

Bearing in mind that CADO is trying to economize on printing costs without sacrificing service to personnel using CADO reports, new forms of reproduction are constantly being tried. One of these forms is miniaturization. The photo-offset method serves this purpose well. Photo-offset is a photographic printing method which affords many more means of reproduction than letterpress. When CADO receives a report which is considered to be of value to the aeronautical field and when numerous copies are needed to meet distribution requirements, the report can be reproduced quickly by photo-offset if the report is good, clean, legible copy. The speed of reproduction is determined by the method. Each page of the report is photographed. The film negative is masked, and the image is burned in on a sensitized metal plate which is to be used as the printing plate. This plate is etched to the desired depth by the use of chemicals. The photo-offset plate can be used over again by graining off the image and by resensitizing the plate. One plate is usually good for approximately 11 exposures. With this method of printing, because of the photographic process of reduction, miniaturization can be accomplished in one of two ways: by pasting up four, six, or nine 8-1/2 x 11-inch pages and reducing them to one 8-1/2 x 11-inch page, thereby cutting printing costs accordingly; or by using a step-and-repeat camera set to the desired reduction and photographing each 8-1/2 x 11-inch page, thereby eliminating paste-up of copy. However, more control of format can be maintained by paste-up of copy. One of the other great advantages of photo-offset printing as compared to letterpress printing is that all the negatives can be filed, and, in the event of a reprint, it is necessary only to burn in new plates. With the letterpress method, the storage of typeset forms would create a problem.

Commander Munson

Good original copy from which the miniaturized form is to be produced, is an extremely important consideration in miniaturization by photographic means. Unless good copy is available, all attempts to miniaturize photographically will fail.

When poor copy is received, the only solution, in most cases, is the restoration or redoing of the report. This, of course, is a time-consuming, expensive procedure when undertaken on any large scale. It is particularly true if graphs, diagrams, or photographs are involved. The problem of poor copy is relatively minor when considering reproduction by letterpress printing. As long as the copy is readable, it is satisfactory, as a plate is made before the printing is accomplished. However, when using techniques involving photographic processes, the quality of the original copy is of vital importance. It is difficult for photographers to equal the readability of copy, much less improve on it. The only solution to poor copy, which is to be reproduced photographically, is complete restoration.

If a clean photographic negative can be made of the reports received by CADO, it is a relatively simple matter to reduce the size of the negative to the desired microfilm size. Contact prints or enlargements can be made also, or the negative can be used to produce offset prints. If a report is received in a clearly printed form, the document may be photographed easily, and legible copies can be produced. However, and it is by no means unusual, if CADO receives a poor ozalid or a poor carbon copy, a more difficult problem is involved. Many times the camera operators have

photographed this type of report and produced the microfilm copy knowing full well that the results would be unsatisfactory. However, it was felt that it would be better to provide the best available copy rather than no copy at all. In many cases, this feeling was not shared by CADO customers. One obvious solution was to request that agencies provide documents in better form. In the case of the German and other captured foreign materials this could not be done. Peenemuende, Focke-Wulf, and Messerschmitt are no longer in a position to provide better copy for processing. However, this was and is possible in the case of American reports. It is interesting to note that, according to CADO camera operators, by and large, the German documents reproduced better than the American counterparts. At any rate, every effort is being made to acquire the best possible copy to the end that CADO may thereby improve the quality of the product it sends to its user agencies.

Mr. Chapman

The number of miniature forms available to the photographer is almost infinite. The lens permits reduction or enlargement in a large variety of sizes. However, some sizes have received somewhat wider acceptance than others -- the 70-mm, 35-mm, and 16-mm microfilm and the microcard.

70-mm microfilm is approximately 3-1/4 x 2-1/2 inches in size. As far as CADO can determine, there are no precision cameras being made at this time to produce this size. However, the camera has been designed and it could be placed in production if a demand were to arise. There is, also, as far as can be determined, no inexpensive transparent reader for 70-mm film in quantity production. Apparently, experimentation is being conducted toward the development of this equipment, but results will undoubtedly not be solidified for some time. There is available, or will be shortly, rapid-processing and printing equipment for making blowups from 70-mm perforated microfilm.

35-mm microfilm is approximately 1-3/8 x 1 inch in size. Cameras are available which can transpose the printed page to the 35-mm film. Dry film duplicating machines, the so-called ozaphane machines, have been developed and are being used at present by CADO.

The dry film duplicating machine is a printer and developer used for making extra film copies from microfilm. The film used is regular film base coated with a diazo dye which is sensitive to only ultraviolet light and, therefore, can be operated in the regular light. The printing light is a water-cooled mercury light that is high in ultraviolet rays. After the diazo-dye film passes over the mercury light, it travels through an ammonia vapor which develops and fixes the film. The speed of the machine may be changed for the different densities which one may encounter. The average speed for printing, developing, and drying a frame is 30 seconds from the time the film passes over the light until it is completed. In other words, 140,000 pages may be reproduced every eight hours. 35-mm readers are becoming fairly commonplace, there being a variety of types readily available to those who require them.

The Airgraph continuous enlarger and processor has been used by CADO to produce 8 x 10-inch blowups from 35-mm microfilm. The Airgraph machine is a separate printer and processor which was used during the war to enlarge 16-mm microfilm in connection with the V-mail program. CADO procured one of these machines and converted it for enlarging 35-mm microfilm to 8 x 10-inch paper copy. The printer is a continuous slit printer.

Film and paper move through the printer proportionally, and the image is printed from 35-mm microfilm to 10-inch x 825-foot paper at the rate of 43 feet a minute.

After printing, the 825-foot roll of paper is removed from the printer and placed on a loading rack at the front of the processor. The paper is then spliced to the leader which is already threaded

through the processor. The paper passes through baths of developer for developing the image, through acetic acid to stop development, through hypo to fix the image, and through water to wash off excess chemicals; afterward the print is dried by means of a water-heated drum. One 825-foot roll may be processed in 1 hour and 30 minutes.

16-mm microfilm is approximately 5/8 x 1/2 inch. Cameras and readers are available commercially and are similar to those used in handling 35-mm microfilm. It is also possible to utilize the ozaphane machines to produce dry 16-mm copies rapidly. The Airgraph continuous enlarger, of course, was designed for use with 16-mm V-mail and can therefore readily accommodate 16-mm microfilm.

A somewhat more spectacular example of miniaturization is the microcard. To produce these cards, which are standard 3 x 5-inch library file cards with the document printed on the reverse side and the catalog information on the obverse, it is necessary first to make a microfilm copy of the document. Any size microfilm (8-, 16-, 35-, or 70-mm) can be used. Then the microfilm must be contact-printed on the 3 x 5-inch photographic paper. A reader for these cards is available.

Commander Munson

A prime consideration in regard to the utility of miniaturized reproduction is the use to which the material will be put. Most banks microfilm their checks on 16-mm film but use this film infrequently and then only to refer for purposes of verification, to what was written on the original check. The telephone company uses small type (6-point) in its directory since this book is used by its customers merely for infrequent reference purposes. Dictionaries are produced in many forms to suit the variety of uses to which they are put. The large, unabridged dictionary, as complete as the lexicographer can make it, requires its own stand; smaller, "collegiate" editions, are available for those who require a dictionary which may be placed between book ends on a desk; and extremely small editions are printed for use as pocket references and for curios. The point is, that the form adopted must be designed to meet the requirements of the user. It is generally conceded that the most usable and readable form into which a document may be put is on the standard 8 x 10-1/2 inch page, with large type, and with sufficient space available for marking margins or underlining passages. A reduced-size printing, 4-up or 9-up, would probably be the next preference from the point of view of utility. The various microfilms and the microcard, all of which require reading aids, suffer by comparison in this respect. However, for reference use only, microfilm and microcard may be more satisfactory than when used for study purposes.

A second consideration is the cost of the miniaturized form. Each activity generating documentary material must exist within budgetary limitations. So, also, must the user. Again, it would be impracticable for the Bell Telephone Company to distribute its directory in microfilm form unless every user could afford a reader - which is not within the usual family budget. The determination of relative cost is a most difficult problem. The variable factors such as quality and form of original copy (i.e., whether it is a third carbon copy, or a film, or a transparency), number of copies made, time, and equipment available make it necessary to make broad statements of costs which do not necessarily apply in each particular case.

In considering printing costs, one, of necessity, becomes involved with another determining factor - the number of copies required. Routine correspondence is typed with a certain number of carbon copies; a letter demanding somewhat wider dissemination is mimeographed; and, if the number of addressees is extremely large, it is more economical to print the letter. So it is with miniaturization. Where it is possible to determine in advance the number of copies that will be required, the selection of form is relatively simple. However, when faced with this quantity unknown, the problem becomes somewhat more complex. In some cases, typewritten copy may be cheaper, more usable, and more satisfactory than other forms if only one to six copies are required. However, if a transparent copy of the original is available, an ozalid copy may be the least expensive.

If only microfilm is available, the Airgraph blowup may be the cheapest. If fifty copies are required, printing may be the answer. If no funds are available for printing or if time is the governing factor, ozaphane copies of microfilm may be the only solution. Current CADO operations are very much affected by this factor of the undetermined number of copies required. After CADO has announced the existence of a given document, it has no way of knowing whether one, five, one hundred, or one thousand requests will be received for that item. Since CADO must supply a copy of each item it announces, within a reasonable period, some method must be employed to produce copies rapidly. Budgetary and space limitations preclude the possibility of printing even ten copies of every document processed and have led to the use of the ozaphane machine to produce 35-mm microfilm copies.

The fourth consideration is the availability of equipment. Many persons have looked hopefully to the future when all documentation will be done by electronic or other revolutionary methods. However, we must consider the wisdom of "doing the best with the tools available." Equipment for all types of miniaturized forms just does not exist in the quantity required. To the man without a reader, a strip of film is next to worthless, regardless of what it contains, since he cannot read it. On the other hand, the invention and development of new ideas and methods need not wait until the auxiliary equipment is available. The Wright brothers did not wait for airports to be developed before inventing the airplane. The utilization of miniature forms by an activity such as CADO, however, should not be undertaken until the using agencies are ready, willing, and prepared to accept and to use them.

The final consideration is the saving in space made possible by miniaturization. A large number of documents can be placed on a small reel of microfilm. When handling large numbers of documents, this saving is not inconsiderable. The CADO microfilm file of all ATI documents occupies only 400 cubic feet. The paper originals, one copy only, occupy approximately 10 times that amount of space. When multifile copies are retained, this figure increases proportionally. No doubt many are faced with the same problem of lack of sufficient available space for storage of documentary materials.

The announcement service of CADO consists of the distribution of ATI translucent sheets or ATI cards. Both are photo-offset printed, using 6-point type. Both could be reproduced by any of the methods described and could be distributed on microfilm or microcard or printed sheet, in 4-up or 9-up form.

Documents are distributed by CADO in two forms. First, if available, a paper copy is provided. This copy is supplied only if CADO has received multiple copies of the original document or if, in some special cases, CADO has reproduced a paper copy of the document. Secondly, if no paper copies are available, a 35-mm microfilm copy is provided.

Since the Air Documents Division started using 35-mm microfilm, much equipment and many refinements have been made to improve the service. Readers have become more universally available, increasing the usability of this form. The modification of the Airgraph enlarger has permitted the production of 8 x 10-inch prints from 35-mm microfilm. The ozaphane machine can produce copies at a rapid rate. The added advantage of microfilm has been that it is convenient for storage of duplicate copies at another location to prevent total loss by fire or by other catastrophies.

This is not to say that 35-mm microfilm is the answer to the problem of widespread dissemination of documents, but only that it is a form which has been and is being used by CADO in affecting large-scale distribution of documents.

DISCUSSION

Mr. Eugene B. Power: University Microfilms, Ann Arbor

The criteria for determining the utility of miniaturized documents are (1) the quality of the image the user will receive, (2) the availability of readers for any method of miniaturization, i.e., their extent, their maintenance, and their expense, and (3) the demand for the document. Inasmuch as CADO cannot, at present, anticipate the demand for copies of announced documents, the microfilm method of reproduction is more suited to their needs. The reproduction of one or one hundred microfilm copies, as the need arises, costs approximately the same per copy as compared to an equivalent number of printed copies but without the investment in unused copies.

Maj Edward H. Olsen: Evans Signal Laboratory

The problem in miniaturization is not the feasibility of the method of reproduction, regardless of size, but the effect on the ultimate user. Of prime importance to the user is the need for improved viewing equipment. Manufacturers should produce a reader which would meet their needs: a reader which is small, compact, and easily handled; a reader with a viewing glass which has no "hot spots" and which does not give a dull image; a reader which would project the image on a white surface. Readers in use today do not meet these specifications. Microfilm, while providing a suitable method of transportation, poses a problem in filing and reference work.

Mr. E. Stanton Brown: Consolidated Vultee Aircraft Corp.

At a previous conference, Col Arnhym reported on the microcard scheme which he had seen in Switzerland sometime ago. I am very much interested in this method and would like to know whether this is considered a practical solution.

Col A. A. Arnhym: CADO

In considering the use of microcards, it must be noted that the equipment for reading is not yet available at the right prices and in the right quantities. At the present time, manufacturers do not feel that there is a sufficient demand for such a reader; however, CADO is fully aware of the possibilities of the microcard scheme and is watching further developments with considerable interest.

Mr. Ralph Shaw: U. S. Department of Agriculture

Microfilming can only be considered as an acceptable method of reproduction if it accomplishes the job it is intended to do. In considering the over-all problem of reproduction, it must be determined at what point it does not pay to microfilm instead of accomplishing full-size prints. In general, companies have determined it to be less expensive to photoprint average periodical articles, considering the time expended by engineers and scientists in using microfilm; microfilm is suitable for long runs of little-used materials.

Maj Edward H. Olsen: Evans Signal Laboratory

Microfilm for research purposes is not acceptable.

Mr. E. Stanton Brown: Consolidated Vultee Aircraft Corp.

Should a concerted effort be made to produce the necessary readers, an effort would be made to sponsor the use of microcards at CVAC. How about CADO?

Col A. A. Arnhym: CADO

If suitable readers are available for microcards and CADO using agencies would prefer this method to any other, CADO certainly would make every effort to meet the desires and requirements of its customers.

Mr. David H. Mason: North American Aviation, Inc.

Until such time as the full details of the program are made known, industry would be in no position to sponsor microcards. In considering the use of such cards, it should be realized that while the cards are suitable for filing purposes, the engineer would desire the full-size document for research work. If the use of the cards was initiated by CADO, would using agencies be able to get full-size copies of the document?

Col A. A. Arnhym: CADO

CADO is now supplying full-size documents where duplicate copies are available. This would also be true if the microcard system were accomplished universally. If no duplicate copies are available, CADO supplies either a copy of the microfilm or, if microcards should at any time take its place, copies of such microcards.

Mr. Walter J. Granfield: Minneapolis-Honeywell Regulator Co.

The use of microfilm is understandable inasmuch as CADO is confronted with a reproduction and storage problem. However, microfilm is not unacceptable at Minneapolis-Honeywell. The company is equipped with a certain number of readers located throughout the Engineering Division, and, in addition, we have an attachment for making photostat copies of those documents determined to be of value. A finished copy can be made in eight minutes. Although the copy is not expected to be as good as the original document, the enlargement is easier to read and to use than the microfilm. Microfilming is the best method by which CADO can supply reproductions of documents. There is no advantage in using microcards as there are no available readers, and the use of such cards would necessitate the establishing of an entirely new system.

Mr. Roy H. Chapman: CADO

A full-size picture cannot be attained with as much ease from a microcard as from a microfilm.

Mr. C. Z. Case: Eastman Kodak Co.

From the remarks of some of the speakers, I think the issue between microfilm and microcards is somewhat confused. Microfilm is suited to uses where material can be satisfactorily filed in rolls of film - but it is not convenient to use where it is desirable to interfile new material with old. It is probably here that microcards would be very beneficial.

Both systems, however, would require projectors of some sort for reading or enlarged reproductions to be made from them. There is no reason to suppose that comparable readers for microcards would be any cheaper than readers for microfilm, for inherently the reflection type of reader is more expensive to make than the transmission type. Furthermore, it is easier to make large reproductions from microfilm than from microcards.

Mr. John K. Boeing: Recordak Corp.

It is customary in some libraries to microfilm the file copies of old newspapers, and it has become evident that those people interested in back editions prefer to read the microfilm copy rather than to read stacks of old newspapers. In spite of the many objections to the microfilm reader, in time, most of the objections seem to disappear. There is no need for producing an inexpensive reader at the sacrifice of quality. Some work is being done, however, on the production of low-cost machines. In addition to the advantages of microfilm which have already been mentioned, copies of material which is not widely distributed or is otherwise unavailable can be obtained on microfilm. While the copy may not be the most desirable, it is better than none at all.

Mr. Eugene B. Power: University Microfilms, Ann Arbor

There is in existence a French system (Thompson-Houston) using microfilm strips approximately 10 inches long (about 20 pages). The reader for these strips is inexpensive, has an opaque viewing screen with no hot spots, but has no advancing mechanism - the strip must be moved by hand. The reader costs less than one hundred dollars and is in use today by a number of European organizations. A reader is being modeled in the United States along the same principle which will accommodate rolls as well as strips. It might be well for CADO to investigate this and other continental systems.

Mr. I. A. Warheit: U. S. Atomic Energy Commission

It is not the policy of the AEC to distribute microfilm copies of its documents; therefore, the problem to AEC is not one of microfilming but of printing. That microfilming has an occasional use is admitted; but by establishing a minimum level for the automatic distribution of each kind of document, AEC has found it less expensive to print. Could not CADO make comparable estimations?

Commander W. H. Munson: CADO

The demand for announced documents cannot be accurately determined until such time as CADO has a permanently established acquisition program. CADO must take into consideration the fact that, for the most part, domestic documents being cataloged in the ATI have been previously distributed and that an automatic distribution of such documents would be a needless duplication of effort.

Capt J. L. Ferguson: CADO

It is seldom that CADO receives more than 20 requests for any one document, excepting documents in the field of guided missiles. CADO averages 50 requests from outside agencies on GM documents.

Col A. A. Arnhym: CADO

If a sufficient number of requests is anticipated, CADO will print copies of a document. However, a microfilm library of documents must still be maintained for security reasons.

Dr. Julian Smith: Office of Naval Research

In determining the effectiveness of any form of reproduction, the user must be the final arbiter of the acceptability of the product.

Mr. Arthur G. Norris: The Johns Hopkins University

How many publishers of documents make a practice of submitting five or more copies of a document? Would not this practice save considerable duplicating expense?

Col A. A. Arnhym: CADO

The acquisition of multiple copies of all documents would be ideal, but such is not always possible. The idea of submitting reports on transparencies to enable effective reproduction has been advanced to publishers repeatedly but with not too much success.

Mr. I. A. Warheit: U. S. Atomic Energy Commission

AEC has established a standard distribution list based upon subject categories and makes an automatic distribution of all documents in printed copies according to this list. We do not and will not distribute microfilm since AEC is controlled by the needs of the users, and it has been determined that the user does not desire microreproduction.

Mr. Robert C. Sale: United Aircraft Corp.

It is my understanding, Mr. Case, that your Research Library at Kodak Park has been using microcards for at least two years. If this is correct, can you tell us the reaction of the scientists and engineers to microcards - do they favor or oppose them?

Mr. J. W. Kuipers: Eastman Kodak Co.

Microcards have been used to some extent at Eastman Kodak but not to such a degree as to make a complete evaluation. The reaction to microcards at the moment can be considered as largely favorable; however, the best possible reader has not yet been built. It is evident that the researcher still needs a full-size copy for certain particular purposes, although the microcard is highly satisfactory for almost all reference needs. Blowups can be made from 16-mm negatives used to make the microcards. The microcard has many promising possibilities in connection with usage and handling within an organization and should be given an intensive trial.

MACHINE METHODS IN DOCUMENTATION

Panel Chairman: Mr. Earle V. Lee — Deputy Director, CADO

Member: Mr. Harold F. Lindenmeyer — Chief, Acquisition Branch, CADO

Mr. Lee

Dr. Fremont Rider, Librarian of Wesleyan University, has estimated that scholastic libraries double their holdings every 16 years and that this trend will continue indefinitely. On this basis, Harvard University will have 8 million volumes in 1962, 16 million in 1978, and 32 million in 1994. Where are all the volumes to be stored, and how is the knowledge contained therein to be organized so that future generations can make use of it? And, while questions are being asked, how can all this material be reproduced?

Perhaps this estimate is fantastic, and yet it was based on the trend as demonstrated by past experience. While CADO is not concerned with printed books, other than with its Reference Library services for Headquarters, AMC, its problem is very similar to that voiced by Dr. Rider. CADO, too, is facing an overwhelming flood of data and is interested in exploring every available means of mechanizing its documentation operations. It is also greatly concerned with the problem of storage space for classified documents.

CADO recognizes that it can only accomplish its mission by providing the individual scientist or engineer with a bibliographical service which will provide for him only those references which will be of value in connection with his immediate research problem. The furnishing of material that must be sorted for pertinent information cannot be tolerated. The probability that a large percentage of the available research effort and talent is being expended in duplicating research which has already been accomplished by some other agency is considered to represent a serious threat to our national security. In order to provide one means for selecting data pertinent to the current efforts of those agencies receiving ATI material, the SAIS has been developed.

It is believed that the ATI sheets are satisfactory as an announcement service. However, for an agency receiving large segments of the ATI, it is probable that a good many sheets must be scanned for pertinent data. Card files are cumbersome and costly to establish and maintain. CADO, therefore, has been looking for some method whereby its service can be made more selective and, consequently, more valuable to the user: it is constantly striving to improve the quality and coverage of its documentation effort.

Since all of CADO's efforts are directed toward the provision of a central documentation service for Navy and for Air Force contractors and for other Government agencies, the expense of any refinement which can be accomplished is more than offset by reduced costs in the accomplishment of Government-financed research effort. Every operation which CADO can accomplish on a one-time basis as a central agency should result in a saving multiplied many times as compared to the cost for each agency in accomplishing the same or similar cataloging operations for itself. There are letters from contractors who have stated that they have been able to abandon cataloging projects, which would have cost many thousands of dollars, because the Air Technical Index had been made available to them.

Those who are familiar with Government fiscal operations realize that CADO estimates its proposed budget at least 18 months ahead, which means that if CADO is to have any money for experimentation with machine methods in the fiscal year 1951, starting 1 July 1950, it must estimate now what funds will be needed and must be prepared to show the need for such funds and to show how it proposes to spend them.

CADO has been constituted only recently. Prior to the signing of its charter by the Secretaries of the Navy and of the Air Force, in October of last year, CADO was officially authorized to complete only the exploitation phase of the German and Japanese captured documents program and to catalog and distribute for the Air Forces the Guided Missiles information. Unofficially, although with the full knowledge and consent of all authorities, CADO had already entered into a considerably broader field. It did not, however, have any authority to conduct any kind of research into machine methods for documentation.

With its official designation as the Central Air Documents Office, and by reason of the policies established by the Research and Development Board recognizing the necessity for experimentation with machine methods, CADO is proposing to include in its 1951 budget request an item which, if approved, will allow it to actively engage in such experimentation. While any activity in this line will probably be on a limited scale, at least at first, one must admit that CADO has a legitimate interest in almost every phase of documentation and reproduction.

"Machine methods" as discussed here, are not concerned with library loan records and book charges, but rather with matters concerned with the cataloging of documents and reports to provide for the further dissemination and complete exploitation of the material represented.

In the beginning, as the Air Documents Division, CADO was required to sort, catalog, and announce as quickly as possible captured documents which were rapidly decreasing in value. There was also the problem of not enough skilled personnel. As an expedient, the documents were handled as raw material and processed on a production-line basis patterned after factory procedures. Each operation was broken into very small individual operations so that semiskilled people could be taught to perform their individual parts in minimum time.

This concept in itself is considered to represent, to a certain extent, the adoption of machine methods, if one can so refer to an operation where human beings and not machines are involved. This basic concept for mass-producing the organization of the results of scientific research is still the foundation upon which CADO operates. The people in the meantime have become better skilled in the accomplishment of their individual tasks, and the methods used have been greatly refined and simplified. The ATI and the SAIS have been devised to replace the Desk Catalog for the purposes of dissemination of information.

One basic difference which does exist is that CADO now has the problem of acquiring the reports for cataloging whereas, in the beginning, the problem was merely one of drawing from the huge store of material already on hand. Another difference is, of course, the fact that the captured documents program was a one-time effort while the present mission of CADO promises to be an ever-increasing operation.

Present procedures include certain adaptations of existing machines. CADO has attempted to institute the use of machines, punch card systems, etc., whenever suitable. It could not do business, for instance, without the Ozaphane microfilm copying machines which can supply copies of any microfilmed document in the file in a matter of minutes. Punched cards are used for various purposes, and CADO is able to use the services of one of the largest punch-card machine installations in the world, which is located at Headquarters, AMC, but which is not actually under its control.

Mr. John E. Burchard of MIT, in a recent article which, while rather imaginative, cannot be considered as being wholly unreasonable, has given an idea of one central library to serve the entire country in the matter of printed reference material. Here the books and documents are to be so filed and cataloged that a page boy or a machine could find a specific item quickly and unerringly. When found, the work would be set before a televisor and viewed over wire or by radio by a distant scholar. This is, no doubt, within the range of modern technological advances. Mr. Burchard then poses the question, how does the scholar know what to ask for? And again he states that probably a coding system could be worked out to provide the answer to this problem.

He is not too optimistic, however, about the possibility of prevailing upon the scholars of the country to engage in the tremendous project represented in establishing such a code. It would indeed require those with the best brains and with the most imagination.

Mr. Burchard suggests that his unified-library proposal should be applicable only to the great mass of material, each library to retain on hand the 5% of their holdings which account for 95% of their circulation, so that not all readers would be forced to use the mechanistic process. He himself was faced with the necessity for planning a new 2-1/2 million dollar library, and his problem was whether such a library should include provisions for the institution of rapid selectors, radio and television, and what have you.

As far as CADO is concerned, there is a very real and pressing problem in that it has an immediate responsibility to process all documents of general aeronautical interest, in whatever language and from whatever source they can be acquired. In the adoption of machine methods, therefore, CADO can only use such machines as are available now. It cannot remain idle waiting for a machine to be invented which will solve all problems. On the other hand CADO must use every practical machine application which will allow it to handle more documents, to produce more copies, and to provide quicker service, as it has an ever-expanding requirement being placed upon it to be met with a fixed number of personnel.

A recent study conducted to establish the relative magnitude of the work load existent against CADO as an agency established to provide a centralized documentation service in the aeronautical field, disclosed the fact that an estimated 370,000 reports, documents, theses, etc., pertinent to the Air Technical Index program are produced annually. In the realm of published technical and scientific material, the following is quoted from a report prepared by the Special Committee on Technical Information of the Research and Development Board.

> "In addition to the normal reporting of progress and accomplishment on current projects, there is a great mass of valuable information being published in scientific and technical journals. A survey reported in 1939 showed that about 750,000 useful scientific and technical papers were being published annually in some 15,000 periodicals. About 250,000 of them were abstracted or indexed in some 300 periodicals that published abstracts or index references regularly. They were indexed or classified, if at all, by many different systems."

This figure of 750,000 items represents an estimate of published technical and scientific papers on a world-wide basis. A substantial percentage is published in foreign languages and will require linguists to prepare abstracts. CADO of course is not proposing to duplicate other abstracting services; CADO does, however, publish the TECHNICAL DATA DIGEST which currently provides an abstract service covering about 4000 technical and scientific articles in the field of aeronautics published per annum.

Coming back to the figure of 370,000 documents estimated to be pertinent to the ATI, the present personnel strength of CADO, using current methods, can accomplish the cataloging and announcement services and supply copies of cataloged documents to fill requests on the basis of about 250 cataloged documents per day, or 70,000 per annum. To process 250 selected documents per day, CADO must screen about three times that number. Many of the documents received are duplicates of those already cataloged, and, of course, a considerable percentage is eliminated as not being pertinent to ATI and are sent to the library for filing. Comparing the 70,000 per annum figure - which CADO is currently capable of processing - with the 370,000 figure, the number of documents produced annually which are pertinent to CADO's mission, it becomes increasingly evident that everything possible must be done to simplify and, in so far as possible, to mechanize CADO's operations so that production figures can be raised to more nearly meet the flow of documents produced. As a further item on the debit side of the ledger, these estimates are on the basis of currently produced material and do not provide for the huge backlog of worth-while documents already existent against the CADO mission.

It is CADO's concept, however, that machines are of value only when properly used, that is, when used actually to reduce the amount of hand labor required. No purpose is gained when such a fascination with machines is indulged in that it takes more time to set up the machine than would have been required to accomplish the job by hand. The machine must pay off in terms of speed, accuracy, and economy.

Furthermore, in adapting or developing machine processes for the production of material, CADO must consider the needs and facilities of its customers. The customer must be able to use what he receives, or there is no use in providing it. In some instances, this applies to the microfilm copies of documents now being supplied, as not all agencies are equipped to handle even such a simple item as microfilm.

If punched cards are furnished to allow the customer to prepare his own bibliographies, he would have to be prepared to obtain punch-card sorting equipment and special files to hold the cards. Any machine process which affects the product, as received by the customer, must first be standardized and must have received a reasonably broad consensus of agreement from all possible users. The customer must be considered further in the matter of the cost to him of acquiring whatever special equipment may be required. CADO must think in terms of What do our customers need? What do they want? What can they afford? as well as What can we supply?

It would certainly be advisable to conduct time studies of all possible systems. Unfortunately, CADO needs the machine equipment to conduct the time studies but does not have it. The American Standards Association is vitally interested in any project to accomplish standardization in any phase of the preparation or the organization of documents.

Mr. Lindenmeyer

During the past decade, there has been an increasing interest among librarians, research workers, scientists, and others in the development and application of machine methods and mechanical techniques in library and research work. This interest was accentuated by experiences during the last war when it became manifest that methods for gaining greater control of scientific data and speed in marshalling that data must be devised.

World War II brought forth increased interest in research and development, and the advent of such instruments of warfare as the atomic bomb and guided missiles served to stimulate this interest. In the armed forces, this interest resulted in the establishment of the Office of Naval Research in 1946 to coordinate all research programs of the Navy Department and the establishment, in the same year, of a Director of Research and Development on the General Staff of the War Department. The Air Force has its Director of Research and Development, and, in June 1946, the Joint Research and Development Board was created to correlate and coordinate the research and development programs of the National Defense organization. Both within and without the Government, the nation is spending more than ever before on scientific research.

With this increased attention to research, the ever-increasing flow of literature makes it more and more evident that attention will have to be directed toward developing mechanical methods of handling this data.

There are probably many individuals who are unfamiliar with some of the developments in mechanization which have come about whereas others are completely familiar with this field.

Most of the efforts toward mechanization by libraries and by research organizations have been directed toward the use of punched cards for indexing purposes and for selection of bibliographical data. However, punched cards for circulation records have been and are being used by a number of libraries, principally in the university field.

Punched cards are of two basic types: (1) Some cards have rows of holes along the edges and the remainder of the card is unperforated. Each hole has a meaning according to the various codes which may be set up. The holes may be clipped either by a hand punch or by a gang punch. Selection of cards containing desired information is made by inserting a sorting needle, similar to an ice pick through a certain hole in a group of cards. When the needle is lifted all those cards drop out which bear the meaning assigned to that hole. These cards go by various trade names, such as Keysort, E-Z Sort, and Rocket and are distributed by the McBee Co., Athens, Ohio; the Charles R. Madley Co. of Los Angeles; and A. A. Rembold and Co. (2) Other cards may be punched over the entire surface by electrically driven punching machines. The basic data is punched on the card, following which various types of machines will rearrange the cards in any desired order, transfer data from one card to another, print the information on the cards or on sheets of paper, or perform various arithmetical operations. Electrical impulses pass through the holes and "read" the data on the cards; the machines are controlled by flexible wire connections which the operator arranges to direct the impulses. These machines are distributed by the International Business Machines Corp. and the Remington Rand Corp.

Business and Government have used punched cards for years for accounting, census taking, personnel records, stock control, and for compiling various statistical data. The cards are being used widely in banks and insurance companies, and, during the last war, the United States Air Force built up a complete statistical control system based on punched card data obtained by means of a system of standardized reports. One of the largest statistically controlled activities in the USAF, in fact, in the world, is located at Wright-Patterson Air Force Base.

To mention briefly the use by libraries of punched cards for circulation records, as long ago as 1936, Ralph Parker described the use of IBM equipment for this purpose at the University of Texas [1], and in 1939 Frederick Kilgour wrote an article on Harvard's use of the Keysort system. [2] Other users of marginal punched cards are Brown University, Pennsylvania State College, the Universities of Georgia, Iowa, Indiana, and Tennessee, the undergraduate division of the University of Illinois at Galesburg, and the Navy Pier Branch at Chicago. The Brooklyn Public Library used punched cards for a short time. The university of Georgia library adopted Keysort cards for its ordering, accessioning, and binding records as well as for circulation records. The University of Florida uses IBM cards. The University of Virginia employs Remington Rand equipment. [3] The Montclair, New Jersey Public Library has employed IBM punched cards for circulation purposes since February 1942 and has, with the aid of the machines, made studies of patrons' reading interests - the kinds of books used and the type of reader using them - studies which might not have been possible if the data had had to be compiled by hand. [4]

The marginal type of punched card has been used considerably in scientific fields to collect bibliographical data. Apparently, this type of card is most useful for individual research workers or for small specialized groups. For the individual who has not had time to collect great amounts of data - such as the college student - or the individual who wishes to prepare articles for publication, the cards might be put to good use.

The cards do not think. Therefore, before the cards can be punched, it is necessary to consider the problem and material carefully, to outline it, and to code it. A considerable amount of ingenuity must be exercised in coding unless, of course, a code which someone else has devised and which will prove suitable for the users' purposes is available.

Direct coding is the simplest method to use but it is useful for fewer items. For numerical coding, greater versatility is achieved through the use of the numbers 7, 4, 2, 1 which, when assigned to four consecutive holes, are called a "field." By clipping one hole or a combination of holes any number from 1 through 14 will result. Fields can be set up for units, tens, hundreds, etc.

A number of articles on their experiments with Keysort cards and methods of coding scientific data have been written by Mr. Gerald J. Cox, Mr. Robert S. Casey, and Mr. C. F. Bailey. Most

of their efforts have been directed toward coding chemical bibliography. These men have been able to combine numerical, alphabetical, chronological, and classified indexing on one card with a considerable number of holes remaining for direct coding.

Their development of the O, I, E, C, B field to represent, when used in different combinations, all letters from A to Z for alphabetic sorting is very interesting. A summary of their experiments appears in their article in the Journal of Chemical Education for February 1947 [5], which also offers some interesting triangular codes. In another article, in the same Journal for October 1946, the authors note numerous applications of marginal punched cards. These include correlation studies on ocular data, on properties and the constitution of chemicals, in genetics in the department of poultry husbandry in an agricultural college, and on data needed to identify organic compounds from their infrared spectra. The cards were also used to analyze the data on dental caries in rats, to compile a bibliography on writing inks, to index insecticides and fungicides, to provide data sources on obstetrical and tubercular case histories, and for making a statistical study of the relationship of the constitution of chemical compounds and their toxicity to fungi and insects. [6]

The United States Army Map Service is using Remington Rand equipment to index its very large map collection which must be indexed in many different ways. This system is used for research problems, to publish an accession list, and for sorting when the maps are distributed to depository libraries. Sets of punched cards were sent out with the maps to these libraries in the hope that they could use the Map Service system. Apparently, this idea was only partially successful since so few libraries have the Remington Rand machines needed to use the cards.

Mr. C. D. Gull, in an article in Special Libraries, September 1947 [7], reports the use of IBM equipment for a number of projects: in the cataloging and accounting of the Surplus Books for Veterans project at the Library of Congress; in the analyzing of replies to questionnaires sent out by the H. W. Wilson Co., and by the Library of Congress about a cumulative catalog in book form; in the preparation of the catalog of the Library of the Department of Education, International Business Machines Corporation, Endicott, N. Y.; in the indexing of Beilstein's Handbuch der Organischen Chemie by Dr. F. D. Taylor of the Dow Chemical Co., Midland, Michigan; in the compiling of a bibliography on cost accounting at the Indiana University School of Business; in the indexing of petroleum patents at Socony-Vacuum Laboratories, Paulsboro, New Jersey; in the correlation of studies of chemical structure and biological activity, studies which proceeded at the National Research Council under the direction of Dr. W. R. Kirner; in the attempt by the U.S. Patent Office to index patents on punched cards; in the compilation of Service Parts Catalogs and an Index of Manufacturers' Instruction Books by the Navy Bureau of Ships; and in producing the Federal Power Commission's Typical Electric Bills for which Mr. L. W. Meyer of FPC has used the IBM Tabulator for about 10 years. Mr. Meyer has also used the card-operated typewriter to produce FPC's Directory of Electric and Gas Utilities. Mr. Gull also reports experiments at the Library of Congress with the IBM card-operated typewriter to develop cumulative classified, author, and subject indexes for the Cumulative Catalog of Library of Congress Printed Cards in book form.

The U.S. Naval Observatory uses the card-operated typewriter to produce the American Air Almanac. Drs. D. E. H. Frear, E. J. Seiferle, and H. L. King at Pennsylvania State College have worked on codes to describe the structure and constituent groups of any chemical compound, especially on compounds tested as insecticides and fungicides. Their code can be used on machine-sorted punched cards with one card for each compound. Since most of the time involved goes into coding the compounds, the following figures are presented to indicate the time necessary for coding: it was found that a chemist can code from 30 to 50 compounds per hour according to their complexity. A trained operator can punch about 100 compounds an hour. The sorting machine will sort cards at about 25,000 per hour. [8]

At Wright-Patterson Air Force Base, the Air Documents Division, predecessor of CADO, used IBM equipment in producing its Desk Catalog of German and Japanese Air Technical Documents,

in six volumes, arranged by author and with abstracts and various indexes in separate volumes such as series, code and model number, and subject. It was also used to compile the U.S. Army Air Forces Dictionary of Aeronautics and Allied Fields, German-English, and the Glossary of German Aeronautical Codes, Models, Project Numbers, Abbreviations, etc. CADO is using IBM equipment today in preparing its List of subject headings for the Standard Aeronautical Indexing System.

There are other types of mechanical equipment, of course, which have been devised. To aid librarians, in particular, there is the Shaw Photo-Charging machine used in circulation work. There is the Adjustable Aligning Device, invented by the Government Printing Office, which is used to prepare the Cumulative Catalog of Library of Congress Printed Cards and the Technical Information Pilot, published by the Science-Technology Project of the Library of Congress. The Adjustable Aligning Device enables catalog cards to be arranged and laid down in columns on cardboard. These cards are then fixed in place with masking tape and the sheets are then ready for photographing and reproduction.

Attention to the use of punched cards is being given by a subcommittee of the American Library Association Committee on Library Appliances and Equipment and by the Punch Card Committee of the American Chemical Society.

Some interesting proposals for the use of microfilm have been made. In 1945, in a talk given before the Philadelphia Special Libraries Association Council, which was later published in Special Libraries [9], Mr. Francis E. Fitzgerald, then Director of Libraries, Office of the Quartermaster General, Washington, D.C., proposed that a Library Service Corporation be set up which would, among other things, distribute punch cards for periodical articles with each card containing an insert of film which would have on it a complete article. The card would be prepunched with a coded classification for filing and with the author, title, and usual imprint information printed thereon similar to the ordinary library card. The code would indicate subject, language, date, and country and would have a serial number to be used in ordering additional copies of the card. There would be blank spaces remaining for additional coding as desired.

To read the articles, small desk projectors were suggested. Photographic enlargements could be made if desired. The cards would be filed in a catalog. Bibliographies could be provided by using copies of the punched cards which would be furnished by the Library Service Corporation; the bibliographies could be kept current by means of standing orders placed with the corporation. The periodical publisher would be reimbursed on a service basis according to the number of cards sold.

Mr. Fitzgerald recommends that libraries file the cards in a classed catalog; larger libraries should have two catalogs - one for the search room and one for the public. The search room would make use of sorting machines, collators, tabulators, etc., to fill local requests.

When material was loaned from the public catalog, a plain punch card, reproduced by machines and carrying the coding, would be placed in the file with the borrower's name and the loan date written on the card. An additional card could be reproduced for the circulation desk. To care for extended loans, photographic enlargements could be provided for a nominal charge.

Another forward-looking proposal was made several years ago by Mr. John E. Burchard of the Massachusetts Institute of Technology. [10]

Mr. Burchard, impressed by the fact that scholastic libraries now double their holdings each 16 years, proposed that libraries retain a collection of the most important books, such as the 200,000 in Harvard's undergraduate library and that the rest of the library's books be sent to a central repository.

There would be, in each library, a completely coded catalog of all the materials in storage. The scholar, who would be the principal user of this catalog since the undergraduate's needs would

be met by the central collection of materials at the university, would employ a rapid selector capable of scanning thousands of references per minute and, by means of abstracts for the items obtained through the selector, would make his request on the depository library. The latter would televise the desired material to the scholar, and, in cases where television proved unsatisfactory, the material could be reproduced photographically for him.

The cost of such a system could be met by the savings realized by libraries which would not have to acquire, catalog, store, and circulate materials which might number thousands or millions.

Prof. Burchard points out some of the difficulties and disadvantages in this scheme. The coding job, which would require great skill, would be an arduous, time-consuming job requiring a degree of cooperation never yet reached by scholars. Other difficulties would be encountered from trustees, donors of buildings and collections, college presidents, and librarians who might hesitate to give up their treasures. Further, scholars asked to make a contribution for the good of all but which would add relatively nothing to their reputation might not wish to cooperate in such a venture.

Rapid selector devices offer a possible solution to the problem of bibliographical control, and it is anticipated that more will be heard of possibilities in this field.

Bibliography

1. Parker, Ralph. Punched Card Method in Circulation Work. Lib. Journal, 61:903-905, Dec. 1, 1936.

2. Kilgour, Frederick G. A New Punched Card for Circulation Records. Lib. Journal, 64: 131-133, Feb. 15, 1939.

3. Stokes, Katherine M. A Librarian Looks at Keysort. Lib. Journal, 72:871+, June 1, 1947; 72:953+, June 15, 1947.

4. Montclair, N. J. Public Library. Circulation Records Control by Punched Cards. P.Co. 1942 11 p.

5. Cox, G. J., Casey, R. S., and Bailey, C. F. Recent Developments in Keysort Cards. J. Chem. Educ., 24:65-70, Feb. 1947.

6. Casey, R. S., Bailey, C. F., and Cox, G. F. Punch Card Techniques and Applications. J. Chem. Educ., 23:495-499, Oct. 1946.

7. Gull, C. D. A Summary of Applications of Punched Cards As They Affect Special Libraries. Special Libraries, 38:208-212, Sept. 1947.

8. Morgan, John A. and Frear, D. E. H. Coding and Sorting Chemical Compounds by Means of Punched Cards. J. Chem. Educ., 24:58-61, Feb. 1947.

9. Fitzgerald, Francis E. Special Librarian and Technical Progress. Special Libraries, 37: 35-40, Feb. 1946.

10. Burchard, John E. The Wreck of Matter and the Crush of Worlds. Technology Review, Nov. 1946.

DISCUSSION

Mr. I. A. Warheit: U. S. Atomic Energy Commission

What punched-card equipment is available in industry at present?

Col A. A. Arnhym: CADO

We have no accurate figures in this respect but it can be assumed that most of the middle-size and large organizations use punch card equipment in one form or another especially for cost accounting purposes. Will those of you who represent organizations maintaining punch card equipment please raise their hands. (A showing of hands indicated that approximately 30% of the organizations represented at the conference had automatic machine equipment which could be used for card selection.)

Mr. Earle V. Lee: CADO

In this connection, it would be possible for CADO to issue catalog cards which could be automatically selected if the users could provide the necessary files and equipment to handle such material. (At this point, Mr. Ralph Shaw, Librarian of the U.S. Department of Agriculture, discussed one of the more recent developments in the field of rapid document selection.)

Mr. John J. Nolan: International Business Machines Corp.

I would like to emphasize that IBM printing equipment was designed primarily for statistical analysis and similar tasks. Therefore, the type, spacing and number of characters provided were keyed to these requirements. However, people in your field have found an answer to some of their problems through use of this equipment. They do so with full realization of its printing limitations.

IBM recognizes the major problems in the field of centralized document indexing and searching and is presently engaged in an extensive engineering investigation of these problems and the machinery necessary for their successful solution.

Mr. I. A. Warheit: U. S. Atomic Energy Commission

IBM machines have been invaluable in the processing of classified documents for which hand receipts are required.

REPORTS STANDARDIZATION

Panel Chairman: Mr. James J. Boucher — Project Coordinator, CADO

Member: Mr. Earle V. Lee — Deputy Director, CADO

Mr. Boucher

For purposes of recapitulation, you have considered the SAIS - the Standard Aeronautical Indexing System - for the selective distribution of documentary material; the ATI - the Air Technical Index - for cataloging, indexing, and announcing the existence of reports; miniaturization to present more in less space and to ease record and storage problems; and machine methods to help you find a report more quickly. This afternoon you will hear about obtaining reports and getting them to the right people.

The special Committee on Technical Information of the Research and Development Board and the Engineering Division here at the Air Materiel Command, among other agencies, have devoted considerable thought and time to the subject of reports standardization, hence it is considered a valid subject for discussion.

Scientific and technical reports are records of investigations. They contain the more formalized presentation of the information obtained from the laboratory notebooks of scientists and technicians. They represent a contribution to knowledge. These reports vary extensively in style and degree of formality depending upon their intended use. Often they include brief technical notes intended only for fellow workers. They may be very extensive descriptions of experiments circulated widely. Immediately it seems clear that type of readership and extent of distribution must exert some influence on style and degree of formalization. The fact also is suggested that technical memoranda often do not find their way into formal reports particularly when experiments have been unsuccessful.

One question which can cause a certain amount of sleeplessness is: How many scientific and technical reports are generated annually? Other questions are: What happens to them? How many are lost? How much is progress retarded if they are not properly published and distributed?

Dealing with such infinitely more accessible items as published books, it is interesting to note that existing library holdings represent perhaps only one-third to one-half of all the books published. The largest libraries in the country have given up any hope of collecting all materials necessary for research. In the face of this hopelessness, the largest libraries have been following a pattern of doubling their holdings every 16 years.

In addition to research conducted by industry and education, research in almost every field and type of science is being conducted by the Federal Government or under its auspices.

There are approximately 750,000 trained scientists, engineers, and technicians in this country today with about 137,000 actually engaged in research, development, or teaching. These people are the major originators of scientific and technical reports. This suggests a considerable volume of reports literature.

Further, this volume may well increase sharply. Declarations have been made that expenditures for basic research should be quadrupled and those for health and medical research should be tripled in the next decade, while total research and development expenditures should be doubled.

It was estimated in 1947 that the national research and development budget for 1957 should include 440 million for basic research, 300 million for health and medical research, one billion for nonmilitary development, and 500 million for military development. The amount of reports literature this would generate is staggering.

Mr. Lee

In discussing reports standardization, it is desired, first, to briefly explore the various types of reports. A suitable title for the major portion of the reports which are of interest to the discussion would seem to be that of research reports or reports of the results of experimentation. Some of these would be "one-time" reports, which, in effect, would state that a particular item of research was engaged in - that this or that was found - and definite conclusions had been established.

We have interim or progress reports. Normally, the group of such reports, pertaining to a particular project, would, of course, be followed by a summary or final report which, if properly prepared, should include the information contained in the several interim reports. This particular group of reports presents a problem for CADO as, while it is necessary to catalog and announce the interim reports as they are received, it might be desirable, upon the receipt of the final reports, to withdraw the interim reports from the Air Technical Index. The entire problem of withdrawal of material is not, however, as simple as it would appear. It frequently becomes necessary to re-use material once thought to be obsolete; therefore, the simplification of files by simply destroying material because it is old is not too practical. Hitler certainly simplified the problem of the libraries of Germany, yet I don't think any of us would recommend that approach. For that matter, the United States, Great Britain, and Russia have further simplified the problems of German research files by seizing their research documents as war booty. In the matter of maintaining records and what at one time might have been thrown away as of no value or further use, an article in the April 2 1949, issue of the Saturday Evening Post, by Henry and Katherine Pringle, titled "Uncle Sam's Strange Filing Case," on the operation of the National Archives in Washington, is very enlightening.

Test reports represent another general group. These reports are ordinarily technical and provide data on the application of known criteria to a specific piece or item of equipment, material, etc. A static-test report on an airplane or a report on the testing of some new material would be a good example of a report falling into this group.

Another category would be technical surveys. Such reports give the status of research in a certain field or a statement of status of an application of research or specialized knowledge. The Government frequently contracts with research organizations to accomplish studies of this nature.

There are undoubtedly other headings under which technical and scientific reports could be grouped, but these general groupings are considered to represent a very primary breakdown.

In any discussion of reports standardization, it also seems pertinent to examine the possible sources and quantities of technical and scientific documents. As has been mentioned, the Steelman Report of 1947 listed the total trained man power of the United States (scientific, technical, and engineering) at 750,000. Of this, 137,000 persons were engaged in scientific research, in technical development, or in teaching. The breakdown of these particular categories is as follows:

BY LOCATION

Industrial Research Laboratories	57,000
Colleges and Universities	50,000
Government	30,000

BY SKILLS

Engineers	42,000
Chemists	30,000
Medical and Health Scientists	15,000
Other Physical Sciences	14,000
Agriculture	12,000
Other Biologists	9,000
Physicists	8,000
Unclassified	7,000

The 1947 Educational Directory of the U. S. Office of Education listed American Colleges and universities as follows:

Senior Colleges	817
Medical Schools	77
Teachers Colleges and Normal Schools	215
Junior Colleges	406

The 1947 Steelman Report further lists 87 senior colleges of the United States as granting the degree of Doctor of Philosophy in the physical and the biological sciences. A considerable number of extremely valuable documents, already received by CADO, have been theses prepared by college students. This is readily understandable when it is remembered that sometimes years of work on the part of the student, often in collaboration with some of the foremost research scientists of the country, goes into the preparation of these theses. Dr. Karl Compton, Chairman of the Research and Development Board, is quoted as follows on this subject:

> "Research work in fundamental science in our universities is one effective means of combining the education of new research workers with production of new scientific knowledge and is, therefore, one of the areas where emphasis is justified."

In the past, these valuable data, in most cases, are given no distribution outside of the immediate associates of the student concerned. Perhaps a few typewritten copies are prepared. The student keeps a copy and one goes into the files. CADO offers the means by which such research effort can be exploited to the maximum usefulness. An intensive acquisition program to obtain copies of theses for inclusion in the Air Technical Index is in the making. It is anticipated that a possible 10,000 such papers, each year, will be considered worthy of announcement through the ATI. This figure is, admittedly, just a guess.

The U. S. Department of Commerce Office of Business Economics' "1949 Preliminary Report," based on a 1947 survey, provides the breakdown of business establishments of the United States as follows:

Wood and Kindred Products	57,000
Textiles and Textile Products	39,000
Leather and Leather Products	5,200
Lumber and Lumber Products	64,200
Paper and Allied Products	3,000
Printing and Publishing	41,700
Chemicals and Allied Products	9,800
Stone, Clay and Glass Products	14,600
Metals and Metal Products	49,800
Others	31,800
Total Manufacturers	316,100
Contract and Construction	271,600
Wholesale Trade	178,200
Retail Trade	1,748,100
Service Industries	722,600
Finance, Insurance and Real Estate	301,800
All Others	257,200
Total All Industry	3,479,500

Most of these categories will produce some reports which we will want to include in the Air Technical Index. At present, the majority of such company-produced reports are only gathering dust in company files. No announcement service has been available, and while, in most cases, unless the documents actually contain company secrets, the individual companies are very happy to have the reports made available for further use, they do not want to go to the trouble and expense of providing copies even if by chance the existence of a particular report becomes known and a copy is requested. This, again, is where CADO comes in. A system which we have locally dubbed the "Give and Take" system - in other words, a system which will provide for the exchange of mutually helpful information between CADO and those civilian agencies producing reports in which we are interested - has been worked out. It is estimated that, from the sources listed on the following chart, a minimum of some 300,000 pertinent reports, each year, can be obtained in addition to the 100,000 produced in accomplishing Government-supported projects.

Documents Generated by National Military Establishment Contracts		100,000
Documents Generated Within NME		50,000
Other Sources (not considering published work)		300,000
	Total	450,000
	80% of total	360,000
College Theses, Dissertations, Staff and Related Reports		10,000
	Total	370,000

The 80% figure, as applied to the foregoing, is again Dr. Compton's estimate. He has estimated that approximately 80% of all technical and scientific reports produced, are pertinent to the science of aeronautics. Dr. von Karman goes even further than this, as he has stated that there is no field of science which is not intrinsically of interest to the science of aeronautics.

These estimates are considered to be definitely on the conservative side and still do not take any cognizance of pertinent reports which may be obtained from foreign sources, nor is the field of published material included. With regard to foreign sources, considerable success is being had in obtaining reports from Great Britain, Canada, and other British Commonwealth nations. Channels also are being opened to obtain reports from Sweden, France, and Italy.

So far, only quantities as related to scientific reports and documents which are not published in the ordinarily accepted sense of being a regularly printed and bound volume have been discussed. In these estimates, reference has been made to items produced generally in a limited number of copies by typewriter, or some form of further reproduction from typed copy. In the field of published technical and scientific material, a reliable survey has established the number of such items produced - on a world-wide basis - at 750,000 per annum. A considerable percentage of such items eventually must be cataloged in the ATI program if CADO is to become a central repository where at least one copy of all data pertinent to the science of aeronautics is to be found. Perhaps in ten years or so we may be able to approach this goal.

The possible standardization of reports preparation is considered to be of extreme importance, although very difficult to accomplish. The problem of prevailing upon everyone concerned to standardize on a general format to be followed in preparing their technical and scientific reports certainly looms as a large-scale undertaking. The Military Services, however, provided again that they can agree among themselves - and such agreement seems, at present, well on the way to being realized - can do a great deal in this matter. As of 26 January 1949, a statement presented to a Subcommittee of the House of Representatives Appropriations Committee, estimated 13,000 research and development projects were currently being worked on in connection with the military Research and Development Program. The figure of 100,000 reports generated by NME contracts as previously used is based on a report prepared by the Office of Naval Research, in collaboration with the Library of Congress. Eighty percent of Government research and development funds go into five fields where large development projects, as well as basic research, are involved. These fields are aeronautics, guided missiles, electronics, ordnance, and atomic energy.

It seems fairly obvious, therefore, that if all the government agencies can develop a standard specification providing for the provision of all reports resulting from Government-financed research, not necessarily in the same format, but organized in accordance with a generally accepted pattern, a considerable step toward reports standardization would have been accomplished, as the

100,000 documents prepared annually under Government control represent from 20 to 25% of the total number of reports produced. The Air Force published such a specification, numbered 40153, on 17 November 1948. This specification is currently under consideration by the Navy Department for possible adoption as a joint Navy-Air Force specification. The present version represents only a first attempt on the part of the Air Force and will probably be considerably altered by the time it has been in use for a while. In the preparation and administration of Government specifications, it seems almost impossible to produce a specification which cannot be misinterpreted. Someone is always reading a meaning into a specification which certainly was never intended when the specification was written. It is surprising what can be read into an apparently innocent sentence, expecially when dollars are concerned.

As a field where standardization of the make-up of reports has been found to be definitely necessary, the guided missiles reports are a good example. In this case, the agencies participating in the Guided Missiles Research and Development Program are divided into groups as (a) those Government agencies receiving copies of all reports prepared; (b) those Government agencies receiving copies of progress reports but not technical reports; (c) major contractors holding contracts for production of a complete missile and receiving complete copies of all technical reports; and (d) component contractors holding contracts for certain specific items such as war heads, fuzes, structures, and power plants. In the case of the latter group, the individual contractor is not entitled to receive the complete reports, but only those reports which are pertinent to his particular fields or projects. For this reason, it becomes imperative that the reports become so standardized in make-up and content that a report prepared to cover a complete missile can be conveniently broken into several individual reports, to allow the furnishing of only that portion pertinent to the contractor's particular program to each of the various component manufacturers. This, again, is where the SAIS pays off in providing a breakdown under which selective dissemination can be controlled.

In the case of the Army-Navy-Air Force Guided Missile Distribution List, a breakdown somewhat similar to SAIS Division I was in use prior to the initiation of the SAIS project. The establishment of this particular distribution system by the Army, the Navy, and the Air Force indicates that the need for something like the SAIS had been recognized.

Mr. Boucher

What types of people are interested in reports? Anyone interested in producing must keep the user of his article in mind. Primarily the user of the report and his requirements are of vital importance if the report is to fulfill its purpose. The primary user is the scientist, engineer, or technician who finds the report fruitful in enabling him to progress in his research. The secondary user is the administrator who is anxious to see that his own technical personnel have access to the ideas they need. The librarian is interested in the report as an item to catalog, suggest in reference services, and include in bibliographies. The publisher is interested in the report as a medium for transmitting ideas without causing undue pain to the reader.

What is the criterion for standardization? Naturally the questions are asked: Is standardization possible? Is it desirable? In some cases standardization might not be worth the cost it would incur or the inconvenience it might create. It is suggested that the following criterion be applied to any suggested standardization factor: Will standardization help the user of the report without imposing an undue burden on the originator of the report?

The national research and development effort is the product of the combined activities of industry, universities, and Government. The three are interrelated and stand together. It is of the utmost importance that one of their chief means of communication, scientific and technical reports, possess a high degree of communicability.

The first problem is probably that of printing or reproducing reports. Publication facilities of many Federal agencies are presently inadequate. Opportunities for publication in universities need expanding, and it is possible that industry could profit by expanded facilities. If publication of research findings is a problem today, it is distressing to consider the problem an expansion of research will pose. The backlog of useful data now printed, often only after long delay, can only increase.

If all worth-while research results were published, there would still be other considerable problems. Even within Government the concept of a central clearinghouse for Federal research reports is still in the process of generation. In Government where sanctions can be applied, there is still no uniform system of marking and identifying Federal research reports. As a result, extreme and needless difficulty exists in classifying reports. Because of the rapid expansion of science and the diversity of terminology existing, there is no satisfactory code for cataloging scientific reports. Further, the decentralization of preparation of abstracts and the centralization of dissemination of abstracts still requires considerable refinement.

Any attempts to standardize scientific and technical reports should be viewed as an exercise of the function of coordination rather than control. It is readily understood that attempting to control research results in at least inferior results if any results at all.

It is possible that standardization is too rigid a term to apply to reports literature. Possibly normalization would be a better word. Perhaps all that is necessary is to codify acceptable practices and make this information available, to be followed on individual reports if applicable.

How broadly can we standardize? If by some strange miracle factors were found where general agreement existed as to possibility and desirability of standardization, a view shared equally by industry, universities, and Government, no problem would exist. Standardization would then come as a matter of course. Unfortunately the usual attitude is: Standardization is all right as long as it suits me. This highly individual reaction is probably responsible for the present state of anarchy. Any government agency can standardize for its own purposes. All Government could standardize if it were deemed desirable. A university or industry can standardize within its own confines. But beyond this, no sanctions exist, and standardization can come about only by general agreement. It is interesting to conjecture that, in one important field, aeronautics, standardization would at least be possible. Almost all aeronautical research work in educational and scientific institutions is supported by the Government.

Style manuals on concepts for the preparation and publication of reports exist and may be responsible for much progress in making reports intelligible and useful. Any university, industry, or Federal agency can have its own manual. The Air Force presently is contemplating publishing such a manual, tentatively entitled "Preparation of Air Force Technical Reports." As planned - and a draft exists - it represents a codification of what the Air Force considers desirable for standardization in the preparation and publication of reports.

Possibly over a period of time, comparison of style manuals will cause some degree of uniformity to exist and solve many of our present problems. This is based on the rather negative approach: Given enough time, if something is really important, someone will do something about it.

What is the case against standardization? Some feel that standardization is a nonexistent problem in the reports field. After all, most of the reports are prepared by scientists. It takes an average of 10 years' training to prepare for independent scientific research. Surely a man with this background is capable of preparing a satisfactory report.

Some feel that standardization inhibits initiative, fixes a dreary sameness on reports, and imposes a rigidity of pattern which is actually harmful. Flexibility is the sine qua non of scientific planning.

Some suspect the review of technical subject matter and view any editorial changes as dangerous. Few men even within the confines of a single laboratory are thoroughly familiar with the detailed specialities of all parts of the laboratory's program. If a fellow scientist cannot sensibly review and improve a report, how can a nonscientist contribute anything to it? This attitude, in all fairness, I should say is restricted to those who have written their first report or who have never intellectually grown up.

Some feel that the present time lag between completion of research and publication of findings is excessive and believe that standardization would only increase this time lag. At present many attest that too many restrictions already exist on the ability of scientists to communicate effectively with their professional colleagues by the publication of research findings.

Some even feel that standardization in matters pertaining to the mind is un-American.

What is the case for standardization? Some feel that unwillingness to standardize where it is clearly demonstrated that standardization is possible and desirable is a sign of backwardness. A nation which is backward in fundamental scientific knowledge and in the interchange of such knowledge is bound to be severely handicapped.

Our strength as a nation has lain in the practical application of scientific discoveries rather than in original discoveries. In the past, we have generally imported our theory from abroad and concentrated on application. Now we are faced with the responsibility of doing much of our basic research. Each scientist must possess a sense of responsibility and interdependence which places a premium not only on discovery but also on the art of communication.

Dr. Verner Clapp has pointed out that, from the standpoint of bibliographic organization and standardization, the field of research literature stands today about where literature in general stood one hundred years ago.

The absence of workable standard means of identifying, classifying, and cataloging reports is a serious barrier to the effective use of research results.

From the dollars and cents point of view, if standardization is possible and desirable it is difficult to argue against it. If greater communicability and accessibility of reports can be achieved, certainly standardization would seem desirable in view of the fact that the Federal Government in 1947 spent 625 million on research and development contracts in addition to the work conducted in its own laboratories. Industrial and university laboratories received 425 million, of which the military controlled 400 million and civilian agencies 20 million, with 5 million scattered. Again it should be pointed out research budgets are expanding rather than contracting. Russia, for example, is engaged in a five-year program of stepped-up scientific training, under which it is reported to be producing 140,000 engineers and scientists each year.

Also, we may have to make better use of our reports literature. It has been strongly recommended that, by 1957, we should be devoting at least one percent of our national income to research and development in the universities, industry, and Government.

There are no known limits to the discovery of knowledge. The only limitations are men and facilities. One of the greatest of these facilities is a communicable and accessible reports literature. This reports literature is our only background material for sensible large-scale program planning.

CADO has very large responsibilities in relation to scientific and technical reports of general air interest. CADO catalogs, announces, and distributes these reports. In effect, CADO has to ask certain questions of these reports and do certain things with the reports. In order to properly catalog and announce the existence of reports, CADO must ask of a report the questions which will

provide the proper entries for an ATI catalog card or its counterpart for the announcement service, the ATItem. CADO would certainly appreciate a degree of standardization which would eliminate difficulties in answering these questions. A title of a report, for example, should be significant and certainly not ambiguous. One should without pain be able to find the name of the author, the originating agency, and the name of the publishing agency if it differs from the originating agency. The date of the report is also of interest as are originating- and publishing-agency report numbers. It should not be necessary to go beyond the title page and the cover, if there is one, for this information.

Many reports are necessarily subject to distribution limitations. It would be helpful to CADO and a protection to the originator if a note on limited distribution, if applicable, were carried on the reverse of the title page. This refers to restrictions to protect the rights of originators. Restrictions on distribution due to the military security classifications of reports are separately provided for.

CADO would be pleased if an abstract, prepared by the author, accompanied the report, preferably printed on the reverse of the title page. This abstract should give a summary of the contents of the report including a statement of its scope and the author's conclusions. For the purpose of the ATI catalog card, eight lines or a maximum of 100 words are allowed for abstracts of foreign documents and 10 lines or a maximum of 125 words for domestic documents. The difference is fixed by entry requirements. A card on a foreign document uses two more lines than a card on a domestic document for cataloging purposes. The foreign title and the name of the translating agency are given.

Here is what CADO has to do with reports: They are used for library reference. They are distributed as paper copies, if possible, upon receipt of valid request. If paper copies are not available, the report is reproduced and distributed as microfilm copy. Consequently, the quality of the original report should be such that good microfilm copies can be obtained from it.

After that, come the big questions: Is the report easy to use? Is it organized with the reader in mind? Is the table of contents a picture of the thought divisions in the report? Is the introduction one which orients the reader and leads him into the body of the report? Is the report well organized? Does the style employed possess communicability or, through needless obscurity and pomposity, does it repel the user? Are footnotes handled intelligently? Does the author know what to include in the body of the report and what should be left to appendixes? Are illustrations well chosen? Are graphs, charts, and tables understandable? Finally, has the publisher of the report exhibited the kindness of considering the comfort of the reader, or has he merely concluded that scientists and engineers are "fine-type boys" and decided to irritate them as much as possible? Other items could be mentioned but these probably convey the idea.

DISCUSSION

Mr. Dwight Gray: Research and Development Board

Reports standardization can be considered in two phases: (1) preparation of copy and (2) reproduction and distribution. Standardization is used at the Applied Physics Laboratory, Johns Hopkins University, within certain limits, i.e., only so far as to insure that the report has an abstract, that the body of the report is arranged in a logical fashion, and that the report contains a conclusion. Researchers, in general, are highly individualistic and must be allowed a certain amount of

elasticity. It is customary at APL for the writer to submit the original draft of a report to an editor. Upon completion of editorial work, the draft is returned to the writer to insure that the report is still scientifically correct. In such a manner, APL can be reasonably satisfied that the organization and style of the report conforms to standards and that the technical content is correct. Industry, as a rule, cannot standardize format in too great a degree and is willing to leave such details to publishers.

Mr. Dan B. Kelsten: Directorate, Research Development, AMC

The Engineering Division, AMC, has only begun to scratch the surface in the program of reports standardization. A sympathetic but passive attitude creates a problem in establishing a case for the importance of technical reports. It must be demonstrated that these reports are worth the time, the effort, and the expense required to prepare them in readable and presentable form.

A reports group has yet to be established in the Engineering Division. The formation of such a structure, has been initiated, but, at best, the plan is for a group that will number less than one percent of the total division writing body as compared to an established industrial standard of four to five percent.

Of the many problems in the program of reports standardization, preparation is one of the most delicate. The researcher does not care to be directed too rigidly in his work. A general application of standards is feasible, but direction must be highly flexible in the detailed phase. Care must be exercised in the determining of a preparation policy for a program of reports standardization lest the structure of cooperative feeling between research and administration be jeopardized. There are sufficient problems not of direct interest to the researcher to which attention should be appropriately paid. Some of these problems have been recognized as those of distribution, of inspection, of classification, of cataloging and of reference. Attempts have been made to cope with these problems in the past and stress will be laid upon these same problems in the future. There is much experimentation yet to be done, and it is from conferences that much of the stimulation and guidance required will be furnished.

Ruth E. Mason: American Standards Association

In the problem of reports standardization, emphasis should be placed on the importance of coordinating the viewpoints of all the groups concerned. There is machinery available to carry out such a coordination program. The ASA is the nation's clearinghouse for voluntary standards. Any organization interested in particular standards can be represented in the committees working on such standards under the procedure of the ASA. The Association, however, does not assume the lead in establishing standards; action is taken only if there is sufficient interest shown and if there is a consensus among the groups concerned. ASA will provide the coordination machinery but the scientific and technical work must be done by the groups themselves.

Mr. David H. Mason: North American Aviation, Inc.

Clearly defined report specifications should be called for by contract or purchase orders to insure standardization, but such specifications should be limited to final reports. Limitations on the issuance of notes and memoranda used to develop the report should be kept as general as possible inasmuch as the application of too many restrictions hinders the preparation of these preliminary data and could possibly result in their not being written.

Mr. Charles K. Bauer: General Electric Co.

In an organization as large as GE there must be standardization of reports. There are directives in the company library which define the preparation of both data folders and technical reports. The difference in format is regulated by its ultimate use; the data folder is prepared for internal use and the technical report for public dissemination. GE has advanced another step in standardization by preparing for published reports a title page which contains sufficient information for cataloging and ready reference, i.e., author, subject classification, number, date, title, abstract, pagination, distribution, and conclusions. The information is so arranged that, where it is desirable, the section can be cut from the page, folded, and filed in a conventional 3 x 5-inch file.

DOCUMENT EXCHANGE

Panel Chairman:	Capt James L. Ferguson	Chief, Document Requirements Section, CADO
Members:	Mr. Leonard Goldman	Civilian Chief, Foreign Documents Section, CADO
	Mr. Harold F. Lindenmeyer	Chief, Acquisition Branch, CADO
	Mr. John C. Green	Office of Technical Services

Capt Ferguson

We have been discussing the problems of document exchange from the standpoint of the Central Air Documents Office. I consider it helpful to give you a brief resumé of the background of CADO and the developments which led to the establishment of requirements for document exchange as they now exist in CADO. This review will be presented by Mr. Goldman.

Mr. Goldman

In 1944, when the Allied Combined Chiefs of Staff initiated a search for war secrets in occupied German territory, little was known of the vast wealth of this material about to be collected or of the complex procedures required for its proper exploitation. There were groups of military and civilian personnel appointed to follow the invading armies and gather all scientific, industrial, and military data. Among these groups were the Air Technical Intelligence teams of the Navy and the Air Force. The tons of documentary material collected and prescreened in the field by these teams were flown to London and stored in a six-story building at 59 Weymouth Street - later to become known as the Air Documents Research Center.

A cable from Dr. Theodore von Karman to Air Force General H. H. Arnold launched the then highly secret "Index Project" - an operation planned to screen, organize, and catalog the 1500 tons of captured documents and reports of air-technical interest. The Index Project, or "IP" as it is still familiarly called, was to be monitored by a group of some 25 prominent American scientists and aeronautical engineers who had been assembled in London for that express purpose. So began the mammoth task of cataloging the captured material in such a way as to form the nucleus of an index which would embrace the entire science of German aeronautics.

In the fall of 1945, it was considered desirable to bring the captured documents to the United States and to complete their processing here since the war in Europe was over and there existed an acute shortage of personnel and equipment necessary to perform this operation. Accordingly, upon the recommendation of General E. R. Quesada, then president of the Army Air Forces Research Board, ADD, the Air Documents Division, was established at Air Materiel Command as the successor of the Air Documents Research Center. Its assigned mission was to process and make available to government agencies, to aircraft industry, and to educational institutions the hundreds of tons of German air documents. Some 800,000 documents were brought to Wright Field. In addition, captured Japanese documents were transferred to ADD to be incorporated in the program.

In November of 1947, 28 months after the IP was initiated in London, ADD completed the cataloging of over 56,000 documents determined to be of primary aeronautical interest. The results of this unprecedented operation were made known to cognizant agencies first in the form of the

Captured Documents Index and later as the Desk Catalog of Captured German and Japanese Air Technical Documents.

It should be noted with interest that the operation of ADRC was a combined effort of the Army Air Force, of the United States Navy, and of the British Air Ministry. When the Center was succeeded by ADD, the Air Force and the Navy continued their cooperative effort, and actual unification was achieved between units of the Air Force and the Navy Bureau of Aeronautics fully two years before formal unification of the Armed Forces was accomplished.

Upon this record of cooperation was based the establishment of the Central Air Documents office. The Office will receive documents of general air interest from all parts of the world, and will act as the central agency for the organization and dissemination of such documents for the Army, the Navy, and the Air Force, and for their contractors, and for industrial, educational, and research institutions participating in the National Aeronautical Research and Development Program.

Capt Ferguson

In briefly reviewing these facts, it has been the intention to convey the idea that CADO represents a centralized documentation effort which, if supported by all concerned, could avoid the tremendous loss incurred through duplication of effort. With this thought in mind, CADO has attempted to design and to implement procedures which will facilitate an equitable exchange of intelligence between the Armed Forces and their contractors.

As an approach to the exchange program, it is necessary to answer this question: "What's in it for us?" To industry, the free exchange of ideas means new products, new processes, and above all, a vital step toward the security of the Nation. To the Armed Forces, it means the prevention of waste, both in time and in funds as well as the providing of facilities for speedier and greater development in all technical fields.

CADO (then the Air Documents Division) had at its finger tips a huge stock pile of captured material for screening and indexing. This stock pile no longer exists. CADO is now faced with the task of promoting an exchange of material involving hundreds of different sources with relatively small amounts at each source. The entire documentation program then depends upon the cooperation of all, just as any centralized operation must.

Mr. Lindenmeyer

In devising an equitable system of exchange of scientific information, it became quite obvious that serious consideration had to be given to the ethical and proprietary interests of industry as well as to the military security interests of the National Military Establishment. No effort was made to circumvent these interests, but a procedure was established which was believed to be satisfactory to all concerned. This procedure is referred to as "limited distribution." Without such a provision, the content of the Air Technical Index would suffer seriously in its practical value. As an example of this point:

> ABC Company develops a propeller which, when tested, goes to pieces and seriously injures or kills an engineer. Now Air Materiel Command has a contract with XYZ Company to develop a similar type of propeller without knowing of the ABC development. ABC Company writes a report about the propeller, assigns a security classification of Confidential to the report, and files it in a vault. Considerable time and expense is involved in the development at XYZ Company before it is discovered that a particular material or engineering feature would result in the same failure as that experienced by ABC Company. Naturally, ABC

Company is not anxious to publicize its mishap and yet, had they done so, Air Materiel Command and XYZ Company would have profited by ABC's experience.

If ABC Company had made this report available to Air Materiel Command for study prior to the awarding of the contract to XYZ Company, this report would have been marked "limited distribution, available to government agencies only." Thus, the report would have been made available to the project engineer for that particular type of propeller, and further development work would have begun where ABC Company had left off.

Perhaps this is not an appropriate example but there are innumerable cases involving many different proprietary and ethical considerations. Although reports generated under government contracts may be generally considered as government property, there are, of course, cases where products or processes may eventually be patented or otherwise accrue profit to the manufacturer. If the reports written under these contracts are to be of any value, they must include all available studies, development work, and results. Failure to include these data means that more research will be necessary on the part of the military agency involved, and omission of such data could not be considered as satisfactory performance on the part of the contractor. The contractor must, therefore, be confident that his sponsoring agency will safeguard his rights and privileges to the same extent as those of the government.

The military security limitations which have been mentioned before are automatically protected through the use of Annual Secrecy Agreement executed on behalf of the contractor before he is allowed to have access to restricted, confidential, or secret data. CADO maintains a Using Agency Roster indicating, among other things, the highest security clearance for each recipient of the Air Technical Index. Although changes occur daily, CADO does its best to keep abreast of all changes and distributes documentary material consistent with those military security limitations.

It may have been noticed that an entry has been made on the ATI catalog card to allow for any applicable distribution note. Different phrases are being used by CADO in limiting the distribution of certain reports, but it is not to be assumed that the limited distribution procedures established by CADO are the complete answers to the problem.

The phrase "LIMITED. Copies obtainable from CADO by U.S. Military organizations only" would apply to the example which has been cited and to certain contractors' reports involving information which should not be placed in the hands of their competitors as well as to certain foreign documents made available to our government with this limitation.

The phrase "LIMITED. Copies obtainable from CADO by U.S. Gov't Agencies only" is similar to the first note except that the scope of the term "Government Agencies" is slightly broader than "Military Organizations." It might be pointed out that the difference between United States military organizations and United States Government agencies is that the latter includes such offices as the Library of Congress, the Patent Office, the Office of Technical Services, the Department of Commerce, and others.

The phrase "SPECIAL. All requests for copies must be addressed to: . . ." would be used in the case of a company or agency which desires to distribute the report rather than allow CADO to do so. It is quite possible that only a limited number of such reports exist and that the company or agency concerned is interested in being sure that only certain other individuals or firms obtain copies of the report. If a person requesting a document should disregard this special distribution note and request this document from CADO, his request would be returned to him pointing out that he should address it to the proper agency for necessary action.

The phrase "LIMITED. Requests for copies must be routed through . . . for approval" would apply in a case where the originator of the report does not have the desire or the facilities to reproduce and distribute a number of copies of the report but is interested in controlling its distribution to the extent that he knows where each copy has gone. This limitation is often used to insure that Guided Missiles reports are distributed only to agencies having a legitimate need for them.

The phrase "Copies of this report obtainable from CADO" is applied to reports for which there is little or no limitation on their distribution and is intended only as a guide to show where the report may be obtained.

Capt Ferguson

There are other specific rules, which might be considered as limitations, to which CADO must adhere. First, CADO is authorized to distribute documentary material only to agencies engaged in work on a government-sponsored contract or project. Second, CADO must comply with the provisions of Air Force Regulation 205-1, and similar Navy regulations, which outline the procedures in handling data bearing military security classifications. Unless you have an Annual Secrecy Agreement with the Government, you will be unable to get ATI (which is a restricted service) or any other material which has been classified as "Restricted," "Confidential," or "Secret." Contractors requesting the Air Technical Index must bear in mind that they can get only that portion which pertains to their project or contract. Before distribution can be made, however, the contractors must have the approval of their project officer or sponsoring government agency authorizing them to receive the specific subject divisions and sections requested. This requirement is designed to assist rather than to hinder distribution since it prevents the automatic distribution of material which is not needed in the performance of a contract and, therefore, prevents needless search through material not pertinent to a program.

In connection with limited distribution, it might be mentioned that there is in existence a special distribution list, generally referred to as the Army-Navy-Air Force Guided Missile Mailing List, which gives the names of approximately 200 guided missile contractors who are directly concerned with that field of interest. Since the Federal Government has subsidized this entire field, CADO must adhere to this list in distributing guided missile information. Any deviations from the list are coordinated through the Guided Missiles Section of the Engineering Division of this Command, which in turn follows the policy laid down by the Guided Missiles Committee of the Research and Development Board, National Military Establishment.

When imposing limitations, it is confusing if contractors and other nongovernment organizations use the terms "Restricted," "Confidential," "Secret," "Top Secret" unless such terms are used in accordance with their designation as military security classification as prescribed in the Annual Secrecy Agreements. The authority to classify reports rests with the sponsoring military agency. It has been suggested that the National Military Establishment change their terminology.

There is a proposal which has been received with very great enthusiasm by many people and which has been termed one of the most important steps in document exchange. Through acceptance of this idea, it is possible that both the Government and the nongovernment agency will profit considerably.

This proposal is based on two concepts: First, that there are many educational and research institutions and other private concerns which are unable to obtain technical information from CADO because they have no contract or project sponsored by the National Military Establishment. Yet, they need the Air Technical Index in their work, which is in the national interest, even though it is not supported by government funds. Secondly, there are many organizations of this type such as universities or private research foundations which have hundreds of valuable reports which they

are willing and even anxious to offer for inclusion in ATI. Such reports would include Doctors' and Masters' theses done in postgraduate schools, company reports on tests and research, and other valuable studies.

Thus, they have something to give and something to take, and, accordingly, we call this proposal the Give-and-Take project.

It amounts to this: A contract could be negotiated between certain organizations and CADO. Such a contract would involve only a token consideration such as a dollar a year or possibly no monetary consideration. The terms of this contract would be essentially that CADO would furnish the user with the Air Technical Index in certain specific subject divisions and sections together with documents cataloged in those fields and, would in turn, receive all reports and documents which could be made available for inclusion in the Air Technical Index to be distributed in accordance with reasonable limitations imposed by the originator.

If such a contract were negotiated, the using agency (which would be a commercial organization, a library or university, or a research institution) would become a contractor of the Government and CADO would be the sponsoring or monitoring Federal agency. It follows that it would be appropriate for CADO to act as the approving authority so far as the requested fields of interest are concerned. All that is required of the contractor, then, is the negotiation of an Annual Secrecy Agreement with Air Materiel Command which would give him access to information bearing a military security classification. Thus, the basic requirements governing the distribution of the Air Technical Index have been satisfied.

Such a contract would be an ideal method of accomplishing the free exchange of technical information between industry and government.

There would be no fixed number of reports to be supplied either by the contractor or by CADO since the quantity of these reports is determined by the amount of research and development work done on the part of the contractor as well as the number of available reports in the particular fields of interest desired by the contractor. Of course no commitment could be made on the part of CADO to catalog and disseminate all reports published by its contractors since many of these reports may not be of general interest. CADO would then be placed on an automatic distribution list of each of its contractors to receive all available technical reports whether they were generated under a government contract or were the results of private research. In either case, the limitations imposed by the originating agency would be followed with regard to distribution.

It is anticipated that the military security classification involved in this type of exchange would not be higher than restricted for the present. The principal idea behind such an exchange is the promotion of free interchange of information between CADO and potential users who would not otherwise have received the Air Technical Index. Such organizations have a very definite need for the ATI and often generate reports which would be of value and of great interest to other government and industrial agencies which receive the ATI.

The value of this operation was established recently through agreements between the Office of Technical Services of the Department of Commerce and CADO. Both organizations have, for a long time, been working together very closely in view of the fact that CADO cannot distribute documentary material to organizations other than agencies and contractors of the Armed Forces. CADO has provided copies of all of its unclassified material to the Office of Technical Services which has been established to make such material available to industry. The latest agreement between OTS and CADO further augments their exchange of documentary material. As OTS represents a centralized documentation activity of considerable importance to the research and development program, we have asked Mr. John Green, Director of the OTS, to give a brief summary of its mission.

Mr. John C. Green — Office of Technical Services

A mission of the Department of Commerce is to collect, compile, and disseminate information to manufacturers of the United States. The Executive Order within the general scope of this mission indicates that information on research in the United States should be released as a matter of national policy. A subsequent Executive Order expanded the mission to include captured material. In compliance with these Orders, the Office of Technical Services secures one copy of all available documents on which there is no military security classification. Press digests are prepared for each of these documents. OTS prepares multilith copies of those documents which probably will sell in considerable number. This group bulks approximately 1% of items acquired. The other 99% are sent to the Library of Congress which will make photo copies on demand. It has become evident that business, as a rule, would rather pay for photo copies than use microfilm.

Documentation is assuming an international scope. As part of the Marshall Plan, there is a Technical Assistance Program to European Industry. In the development of this program, however, few engineers have been sent to Europe to perform actual work in the factories. A system for exchanging documents among existing document centers (primarily British, French, and Dutch) is under discussion. In all probability the United States will be invited to participate. The Anglo-American Council of Productivity is making a study in order to improve production in England. The first report of this study indicated that Great Britain has encountered difficulty in developing expeditious procedures for issuing technical information. At the Conference of the Royal Society, where the subject "Problems in Scientific Documentation" was discussed, an international system of documentation was recommended. At present, the methods of international exchange seem to operate more efficiently on paper than in practice. The problem which must be solved is "What is the most efficient and beneficial system of document exchange within security limitations?"

Capt Ferguson

Each organization participating in the ATI program should designate an official who is properly cleared and authorized to receive and to make internal distribution of documentary material within that organization. Such action is particularly necessary to avoid confusion in handling requests as well as shipments to the participating organization.

It should be pointed out that very often organizations are unable to provide copies of reports to CADO because they have only one report available and hesitate to release it. CADO is prepared to accept items for inclusion in the ATI on a 10-day-loan basis guaranteeing their return in the same condition as they were received. The processing of loan documents of this nature is handled with the highest possible priority.

Of course, much time and effort could be saved if the copies furnished to CADO for processing were of sufficient contrast to be readily reproducible. The most desirable type of copy in this connection is the reproducible copy itself such as negatives, carbon backs, and transparencies.

Should there be any cases where the content of the abstract may possibly reveal information which should not be disseminated, it is suggested that the organization submitting the report for inclusion in the ATI write the abstract to safeguard a possible compromise of proprietary or ethical rights.

Mr. Goldman

Foreign documentation is the creation of a supplement to the Air Technical Index, the scope of which is the translation of foreign language documents as required by CADO in support of the National Research and Development Program; the technical checking of translations prior to publication; the maintenance of an index of translations of general air interest prepared by government

agencies, by translation contractors, and by civilian organizations, and the maintenance of systems required to avoid duplication of translation effort; the providing of consultant translation facilities and services, other than interpreter services, for the National Military Establishment as directed; the compilation and preparation for publication of periodic status reports on all translations completed by other agencies; the preparation of digests for all foreign language documents for which translations are not accomplished; and the compilation and cataloging of all foreign documents preparatory to further processing and publication.

To take full advantage of this vast potential store of technical knowledge, a continuous exchange of foreign reports and translations is prerequisite.

There are but a few major points to be considered in utilizing these data more fully. It is necessary to have a complete understanding of the foreign cataloging procedures in order to process each report - to prepare digests of untranslated documents adequately and effectively; and to translate or to exchange translations on a broad scale, either through the medium of periodic accession lists of translations or through cooperative agreements with interested agencies.

Capt Ferguson

Most persons have, on some occasion, been dissatisfied with the service that they have received from CADO. Although this is not unexpected, it is cause for consideration. CADO is dedicated to serving its using agencies, but, as is true with most service organizations, it can not satisfy all of its customers all of the time.

A new form, Form 98, (Fig. 4) has been designed in an effort to reduce the delays which occur as the result of necessary recording and correspondence. Basically, it is a combined shipping and receiving voucher with the emphasis placed on brevity.

The form will be reproduced from a master ditto copy, and, upon initiation of a request, there will be a sufficient number of copies prepared to take care of all necessary correspondence and records so that the need for actual letters may be eliminated.

In the upper left section of the form are the identifying references which are always so necessary when placing orders and filling requests.

(1) The CADO ORDER NUMBER is assigned upon receipt of the request and is used thereafter when referring to the request.

(2) The REQUESTOR CODE NUMBER also is assigned upon receipt of the request and is merely a numerical designation of that requestor for convenience in filing and in keeping statistical records.

(3) The entry REQUESTOR CLEARED FOR is one which indicates the highest military security classification for which the requestor is cleared. He may not, then, receive documentary material classified higher than this.

(4) The DATE RECEIVED IN is the date on which CADO receives the request.

(5) The DATE OF ACTION is the date on which action is taken to fill the request.

(6) The REQUESTOR'S REFERENCE is the letter of request which may be identified by its date or by some other means.

(7) The REQUESTOR'S FILE CODE is the reference number such as a file serial number or initials or other identifying information established by the requestor.

CADO ORDER NO: _____

Requestor Code No: _____

Requestor Cleared For: _____

Date Received In: _____

Date of Action: _____

Requestor's Reference
See Letter (Request) Dated:

REQUESTOR'S FILE CODE:

Return Signed Voucher To:

CENTRAL AIR DOCUMENTS OFFICE
Wright-Patterson Air Force Base
Dayton, Ohio

CONTRACT NO:

SHIP TO:

ATTN:
MARKED FOR:

MAIL ADDRESS:

ITEM NO.	STOCK NO.	AUTHOR, TITLE, ORIGINATING AGENCY, FOREIGN TITLE, ETC.	QUAN.	CLASS.	VALID	Acquisition	ATI Stock	REPRODUCTION					ACTION DATE		
								Microfilm	Ozalid	Photostat	Airgraph	Print	Suspended	Completed	Shipped
1.															
2.															
3.															
4.															
5.															
6.															
7.															
8.															

Receipt is acknowledged of the items shown under "Action Date" as shipped. Items which are classified either Secret, Confidential or Restricted will be handled in accordance with the provisions of the applicable security regulations of the military services.

Signed: _____ Date: _____

USER				
Industry	Education and Research	Government (Military)	Government (Non-Military)	Foreign
☐	☐	☐	☐	☐

SPONSOR			
Army	Navy	Air Force	CADO
☐	☐	☐	☐

MCI Form No. 98

WF-(B)-O-28 MAR 49 12M

Fig. 4 - Form No. 98

In the upper center section of the form is the address to which you direct your correspondence (CADO) and the contract number which serves as our authority for providing the material requested. Project numbers or code names are equally as authoritative.

In the upper right section is the address of the requestor and the name or symbol of the person to whom the shipment will be addressed.

In the lower right section, various blocks will be checked to indicate the type of organization requesting the document and its sponsor or sponsors. These data are the basis for statistical reports prepared periodically in connection with CADO operations.

In the lower left section is a statement of receipt to be signed by the person designated by the requesting organization to handle documentary material from CADO. The signed voucher indicates a completed shipment. Receipt may be acknowledged for partial shipments in the same manner.

The center section of the form is generally divided into two parts: (1) identifying information concerning the items requested and (2) action taken on the request.

(1) STOCK NUMBER is the ATI number or other designation such as reel and frame, etc.

(2) AUTHOR, TITLE, ORIGINATING AGENCY, FOREIGN TITLE, ETC., identifies the document.

(3) QUAN is the number requested.

(4) CLASS designates the military security classification of that specific item.

(5) VALID indicates that a check has been made by CADO to determine that the request is legitimate and that the requestor is authorized to receive the material.

(6) ACQUISITION means that CADO does not have the item requested but is taking steps to acquire it.

(7) ATI STOCK means that CADO has a printed copy on hand and can furnish it without delay.

(8) REPRODUCTION indicates the type of reproduction to be furnished in the event a paper copy is not available.

(9) ACTION DATE shows on what date reproduction was begun and on what date the item was eventually shipped to the requestor.

Rubber stamps will be used to indicate the action in any of these columns.

A copy of the form will be used to acknowledge a request immediately upon receipt of an order so that future references or follow-ups may be expedited.

DISCUSSION

Mr. Robert A. Cole: Wright Aeronautical Corp.

What disposition can be made of overclassified documents of organizations no longer in existence?

Col A. A. Arhym: CADO

CADO is in the process of establishing a Classification Review Board. All documents processed by CADO will flow through this board, and those documents which are within the jurisdiction of CADO will be declassified if such is considered necessary. Documents over which CADO can exercise no control are referred to the office of origin or of primary interest - in the case of an organization which is no longer in existence - with the recommendations for their declassification.

Capt F. W. Angevine: Office of the Director of Intelligence, USAF

Some of your organizations may have experienced difficulty in securing clearance for the use of specific foreign documents, mainly British. Due to the low security clearance of this conference, I must limit my remarks to pointing out that, although the majority of air research in the United States is accomplished by private industry or contractors, British air research in contrast is mainly accomplished by government organizations. Therefore requests by U. S. Armed Forces contractors for classified British documents must be routed through the Director of Intelligence to Air Attaches or Technical Liaison Officers who secure permission for your use of the documents requested direct from the originating agencies. This is, due to its mechanics, a time-consuming process.

Capt J. L. Ferguson: CADO

I should like to hear some comments from the audience as to whether there are any evident instances of limited distribution which have not been automatically covered in our previous discussion concerning distribution notes. (No comments.)

Mr. Walter K. O'Loughlin: Commercial Solvents Corp.

As a chemical company, Commercial Solvents Corp. is currently interested in research on propellants and in obtaining any available information on propellants in order not to duplicate research efforts.

Mr. Clarke C. Miller: Standard Oil Co. (Indiana)

There is a time lag between the reading of papers at meetings and the publishing of the reports. The few available copies cannot begin to fill the demand for preprints. Can CADO reduce this lag by processing these technical papers in the Air Technical Index?

Col A. A. Arnhym: CADO

As mentioned before, CADO includes abstracts of technical papers and meeting reports in the TECHNICAL DATA DIGEST before or at the same time that such papers are presented by obtaining pre-publication information from various engineering societies. The processing of the complete report depends entirely on whether the publishing or originating agency can make copies available for distribution.

Evelyn F. Caswell: Massachusetts Institute of Technology

Any centralized documentary agency should define the parameters of the job to be accomplished in order to eliminate unnecessary duplication of effort. No one office can adequately cover every field of endeavor. Are there then any limits to the field of cataloging as being accomplished by CADO?

Col A. A. Arnhym: CADO

The scope of CADO is dependent upon its assigned projects. CADO and its predecessors - the Air Documents Research Center and the Air Documents Division - did not request but were directed to accomplish the Index Project of captured documents, to catalog guided missiles information and subsequently all data of general air interest, and to assist in the initiation and operation of the SAIS. In accomplishing these and other projects, CADO will go only as far as its assigned mission requires and as its using agencies demand. The operation of Cado must overlap documentary services of other agencies of the National Military Establishment as little as possible, yet be of sufficient scope to be a Central Air Documents Office not only in name but also in fact. This does not imply that smaller documentation activities are thereby obsoleted - on the contrary, because these smaller activities can now receive from CADO the tools which they require to operate on a broader and more effective basis than ever before. There may be some duplication of effort - some place along the line. However, duplication of effort in any initial operation is not only permissible but preferable since the time, money, and effort which may possibly be expended for the duplication of cataloging and indexing is very much smaller and less serious than the duplication of research and development.

APPENDIX I

ROSTER OF CONFEREES

Adams, R. R.	Battelle Memorial Institute
Adams, William A., Maj	Directorate of Intelligence
Allen, E. T.	Boeing Aircraft Co.
Allerding, Johanna E.	University of California
Amoss, Alice M.	Army Chemical Center
Angevine, Frank W., Capt	Directorate of Intelligence
Ankeney, Karl	Intelligence Department, AMC
Anton, Gladys	Intelligence Department, AMC
Barton, Adah M.	Edwal Laboratories
Bauer, Charles K.	General Electric Co.
Beaver, June F.	University of Chicago
Becker, Joseph	Central Intelligence Agency
Beckett, Charles, Dr.	Ohio State University Research Foundation
Boeing, John K.	Recordak Corp.
Booghier, Robert	Intelligence Department, AMC
Bonser, Thomas H.	Directorate, Research and Development, AMC
Bradley, L. P.	McDonnell Aircraft Corp.
Brantlinger, Rita	Pittsburgh Plate Glass Co.
Brown, Elizabeth	Naval Air Material Center
Brown, E. Stanton	Consolidated Vultee Aircraft Corp.
Brown, Therman D., Lt Col	Air University
Bryant, Royal C.	Engineering Research Associates, Inc.
Budde, Fred L.	Intelligence Department, AMC
Bullard, Charles F.	Eastman Kodak Co.
Burrell, Helen	Republic Aviation Corp.
Burton, Elizabeth M.	U. S. Naval Ordnance Plant
Butler, W. W.	Engineering Research Associates, Inc.
Canova, Madeline F.	Bureau of Ordnance
Canter, Louis	National Bureau of Standards
Carmichael, Mary D.	Special Devices Center (ONR)
Case, Charles Z.	Eastman Kodak Co.
Caswell, Evelyn F.	Massachusetts Institute of Technology
Clark, Walter, Dr.	Eastman Kodak Co.
Clingerman, W. R., Col	Intelligence Department, AMC
Cole, Robert A.	Wright Aeronautical Corp.
Collins, Dan J.	Northrop Aircraft, Inc.
Comstock, Marjorie	Signal Corps Engineering Laboratories
Cook, Orvill R., Major General	Deputy Commanding General for Operations, AMC
Cowling, H. T.	Directorate, Research and Development, AMC
Craven, Ruby S.	David W. Taylor Model Basin
Cutler, Lillian R.	Civil Aeronautics Administration
Daniels, Howard L.	Engineering Research Associates, Inc.
Davis, I. E.	Intelligence Department, AMC
Dempsey, Byron	Directorate, Procurement and Industrial Planning, AMC
Devore, Helen	Signal Corps Engineering Laboratories
Drake, E.	Directorate, Research and Development, AMC
Dyke, H. Gordon	Radio Corp. of America
Endean, W. C.	Mine Safety Appliances Co.

Evans, Dale N.	University of California
Evans, Elma T.	Cornell Aeronautical Laboratory
Flagg. Cedric R.	Research and Development Board (NME)
Fowler, Harold E.	U.S. Naval Postgraduate School
Franey, Leona O.	Bell Aircraft Corp.
Franklin, Frederick	Fairchild Engine & Airplane Corp.
Fulmer, Elbert P.	Intelligence Department, AMC
Gaines, K.	Intelligence Department, AMC
Githens, Sherwood, Jr.	Johns Hopkins University
Goll, M. E.	Intelligence Department, AMC
Granfield, Walter J.	Minneapolis-Honeywell Regulator Co.
Grant, L. M., Rear Admiral	BAGR, Central District
Gray, Dwight, Dr.	Research and Development Board (NME)
Green, John C.	Office of Technical Services
Gregory, Rolf	Fairchild Engine & Airplane Corp.
Gujer, Edward Jacob, Jr.	Directorate, Research and Development, AMC
Hauck, Helen Giffin	Rensselaer Polytechnic Institute
Hill, Edward L.	Fairchild Engine & Airplane Corp.
Himwich, Williamina A., Dr.	Johns Hopkins University
Hintz, Harvey P.	Eastman Kodak Co.
Hoff, Ruth L.	U.S. Naval Ordnance Test Station
Hoffman, Erwin F., Dr.	National Cancer Institute
Hoffman, George H.	Intelligence Department, AMC
Hoffman, Miriam S.	Curtiss-Wright Corp.
Holding, J. B.	Battelle Memorial Institute
Holloway, Helen	Polytechnic Institute of Brooklyn
Holloway, O. W.	Office of Technical Services
Hooker, Ruth H.	Naval Research Laboratory (ONR)
Hopp, Ralph H.	Battelle Memorial Institute
Husser, John H.	Comptrollers Department, AMC
Jennings, Kathryn M.	Naval Air Material Center
Jones, H. Lee	Intelligence Department, AMC
Jones, Sarah Ann	National Bureau of Standards
Kelsten, D. B.	Directorate, Research and Development, AMC
Killian, L. G.	Cook Research Laboratories
Knott, Earl	Fairchild Engine & Airplane Corp.
Krixtein, Simon	Intelligence Department, AMC
Kruse, Caroline J.	U.S. Naval Ordnance Test Station
Kuipers, J. W.	Eastman Kodak Co.
Landuyt, Miriam	Caterpillar Tractor Co.
Leach, Lois	Armed Forces Staff College
Leghorn, Richard S.	Eastman Kodak Co.
Lindenbaum, B.	Directorate, Research and Development, AMC
Lunsford, Jesse B.	Bureau of Ships
Lyon, Ethel	National Advisory Committee for Aeronautics
MacDonald, Hazel B.	Naval Ordnance Laboratory
MacDonald, Virginia	Armed Forces Staff College
Mason, David H.	North American Aviation, Inc.
Mason, Ruth E.	American Standards Association
Max, George D.	Cambridge Field Station, AMC
McDowell, W. M.	Remington Rand, Inc.
McGuinness, J. J.	Remington Rand, Inc.
McKenzie, Malvin, Lt Col	Air University
Meighen, William	Intelligence Department, AMC
Metter, Ray	Intelligence Department, AMC

Milek, John T.	Babcock and Wilcox Co.
Miller, Clarke C.	Standard Oil Co. (Indiana)
Mitcham, C. S.	Intelligence Department, AMC
Morris, Albert V.	Central Intelligence Agency
Murray, James	Directorate, Research and Development, AMC
Nelson, V. G.	Directorate, Research and Development, AMC
Neville, Leslie E.	Institute of the Aeronautical Sciences
Nivison, Wade S.	Recordak Corp.
Nolan, John J.	International Business Machines Corp.
Norris, Arthur G.	Johns Hopkins University
Norris, William C.	Engineering Research Associates, Inc.
O'Loughlin, Walter K.	Commerical Solvents Corp.
Olsen, Edward H., Maj	Evans Signal Laboratory
Ottemiller, John H.	U. S. Department of State
Otto, Carl S.	Revere Corp. of America
Pfanner, Robert	Comptrollers Department, AMC
Phillips, Marshall	Directorate, Procurement and Industrial Planning, AMC
Pope, Samuel E.	Directorate, Research and Development, AMC
Postell, Paul E.	Air University
Power, Eugene B.	University Microfilms
Protzmann, H. E.	Transcontinental & Western Air, Inc.
Purcell, Marie	Cambridge Field Station, AMC
Rice, Thomas A.	Intelligence Department, AMC
Rooker, Thelma	Tide Water Associated Oil Co.
Ross, Anna	Intelligence Department, AMC
Rudd, R. G.	Eastman Kodak Co.
Rudis, M. P.	Rockwell Engineering Co.
Rutledge, C. E.	Boeing Aircraft Co.
Sale, Robert C.	United Aircraft Corp.
Samaras, D. G.	Office of Air Research
Schuchman, Jack M.	Eastman Kodak Co.
Scott, Earl L.	Intelligence Department, AMC
Sharp, E. A.	Intelligence Department, AMC
Shaw, Ralph R.	U. S. Department of Agriculture
Shay, Joanna V.	Naval Air Material Center
Sheehy, Joseph R.	Comptrollers Department, AMC
Shriver, A. E.	International Business Machines Corp.
Shuler, Carl J.	Comptrollers Department, AMC
Simon, Kriteen	Intelligence Department, AMC
Skidmore, William F., Lt	Joint Intelligence Objectives Agency
Sloan, Ralph T.	H. L. Yoh Company, Inc.
Smelt, Ronald	Naval Ordnance Laboratory
Smith, Claude	Minneapolis-Honeywell Regulator Co.
Smith, G. A.	Intelligence Department, AMC
Smith, Julian	Office of Naval Research
Smith, Laura	Intelligence Department, AMC
Smith, Leland R.	General Motors Corp.
Smith, Maurice H.	Institute of the Aeronautical Sciences
Story, William E., Jr., Dr.	General Staff, U. S. Army
Thomas, Helen L., Dr.	Raytheon Manufacturing Co.
Thorne, Ned M.	Institute of the Aeronautical Sciences
Tinkham, Maynard F.	School of Aviation Medicine
Turnbull, F. W.	Sperry Gyroscope Co.
Viggiano, Joseph G.	Naval Air Material Center

Wadland, Robert L.	General Electric Co.
Wangerin, E. O.	Eastman Kodak Co.
Warheit, I. A.	U.S. Atomic Energy Commission
Weir, Richard A., Lt	Directorate, Research and Development, AMC
Weigel, William G.	U.S. Naval Ordnance Test Station
Weitlauf, Frederica M.	Timken Roller Bearing Co.
Welty, Francis D., Sgt	School of Aviation Medicine
Whittlesey, D. W.	Directorate, Research and Development, AMC
Wiley, Joseph L.	Bureau of Mines
Wilkinson, Giles A.	Recordak Corp.
Wilson, Barry	Special Devices Center (ONR)
Winkler, Frank	Intelligence Department, AMC
Woodham, Ruland M.	Institute of the Aeronautical Sciences
Zarse, Robert E.	University of Chicago

Fig. 5 - Centralized Documentation Conference, 11-12-13 APRIL 1949

APPENDIX II

ORGANIZATIONS REPRESENTED AT THE CONFERENCE

Air Materiel Command
Wright-Patterson Air Force Base
Dayton, Ohio

- BAGR Central District
- Comptrollers Department
- Directorate, Procurement and Industrial Planning
- Directorate, Research and Development
- Intelligence Department
- Office of Air Research

Air University, USAF
Maxwell AF Base
Maxwell, Ala.

American Standards Association
New York, N. Y.

Armed Forces Staff College
Norfolk, Va.

Army Chemical Center
Maryland

Babcock & Wilcox Co.
New York, N. Y.

Battelle Memorial Institute
Columbus, O.

Bell Aircraft Corp.
Buffalo, N. Y.

Boeing Aircraft Co.
Seattle, Wash.

Bureau of Mines
Department of Commerce
Bruceton, Pa.

Bureau of Ordnance
Department of the Navy
Washington, D. C.

Bureau of Ships
Department of the Navy
Washington, D. C.

Cambridge Field Station, AMC
Cambridge, Mass.

Caterpillar Tractor Co.
Peoria, Ill.

Central Intelligence Agency
Washington, D. C.

Civil Aeronautics Administration
Experimental Station
Indianapolis, Ind.

Commercial Solvents Corp.
New York, N. Y.

Consolidated Vultee Aircraft Corp.
Ft. Worth Division
Ft. Worth, Tex.

Cook Research Laboratories
Chicago, Ill.

Cornell Aeronautical Laboratory
Cornell Research Foundation
Buffalo, N. Y.

Curtiss-Wright Corp.
Propeller Division
Caldwell, N. J.

David W. Taylor Model Basin
Washington, D. C.

Directorate of Intelligence, USAF
Washington, D. C.

Eastman Kodak Co.
Rochester, N. Y.

Edwal Laboratories, Inc.
Chicago, Ill.

Engineering Research Associates, Inc.
St. Paul, Minn.

Evans Signal Laboratory
Belmar, N. J.

Fairchild Engine & Airplane Corp.
Fairchild Aircraft Division
Hagerstown, Md.

Fairchild Engine & Airplane Corp.
NEPA Division
Oak Ridge, Tenn.

General Electric Co.
Schenectady, N. Y.

General Motors Corp.
Allison Division
Indianapolis, Ind.

General Staff, U.S. Army
Washington, D. C.

Institute of the Aeronautical Sciences
New York, N. Y.

International Business Machines Corp.
New York, N. Y.

Johns Hopkins University
Applied Physics Laboratory
Silver Spring, Md.

Johns Hopkins University
Army Medical Library
Silver Spring, Md.

Joint Intelligence Objectives Agency
Washington, D. C.

Massachusetts Institute of Technology
Cambridge, Mass.

McDonnell Aircraft Corp.
St. Louis, Mo.

Mine Safety Appliances Co.
Pittsburgh, Pa.

Minneapolis-Honeywell Regulator Co.
Minneapolis, Minn.

National Advisory Committee for Aeronautics
Lewis Propulsion Laboratory
Cleveland, O.

National Bureau of Standards
Washington, D. C.

National Cancer Institute
Bethesda, Md.

North American Aviation, Inc.
Los Angeles, Calif.

Northrop Aircraft, Inc.
Hawthorne, Calif.

Office of Naval Research
Washington, D. C.

Office of Technical Services
Washington, D. C.

Ohio State University Research Foundation
Columbus, O.

Pittsburgh Plate Glass Co.
Pittsburgh, Pa.

Polytechnic Institute of Brooklyn
Brooklyn, N. Y.

Radio Corp. of America
RCA Laboratories
Princeton, N. J.

Raytheon Manufacturing Co.
Waltham, Mass.

Recordak Corp.
New York, N. Y.

Remington Rand, Inc.
New York, N. Y.

Rensselaer Polytechnic Institute
Troy, N. Y.

Republic Aviation Corp.
Farmingdale, N. Y.

Research and Development Board (NME)
Washington, D. C.

Revere Corp. of America
Wallingford, Conn.

Rockwell Engineering Co.
Blue Island, Ill.

School of Aviation Medicine, USAF
Randolph AF Base
Randolph Field, Tex.

Signal Corps Engineering Laboratories
Ft. Monmouth, N. J.

Special Devices Center (ONR)
Port Washington, N. Y.

Sperry Gyroscope Co., Inc.
Great Neck, N. Y.

Standard Oil Co. (Indiana)
Chicago, Ill.

Tide Water Associated Oil Co.
New York, N. Y.

Timken Roller Bearing Co.
Canton, O.

Transcontinental & Western Air, Inc.
Kansas City, Mo.

United Aircraft Corp.
East Hartford, Conn.

University Microfilms
Ann Arbor, Mich.

University of California
Los Angeles, Calif.

University of California
Sandia Laboratory
Albuquerque, N. M.

University of Chicago
Chicago, Ill.

U.S. Atomic Energy Commission
Oak Ridge, Tenn.

U.S. Department of Agriculture
Washington, D. C.

U.S. Department of State
Washington, D. C.

U.S. Naval Air Material Center
Philadelphia, Pa.

U.S. Naval Ordnance Laboratory
White Oaks, Md.

U.S. Naval Ordnance Plant
Indianapolis, Ind.

U.S. Naval Ordnance Test Station
Pasadena, Calif.

U.S. Naval Postgraduate School
Annapolis, Md.

U.S. Naval Research Laboratory
Washington, D. C.

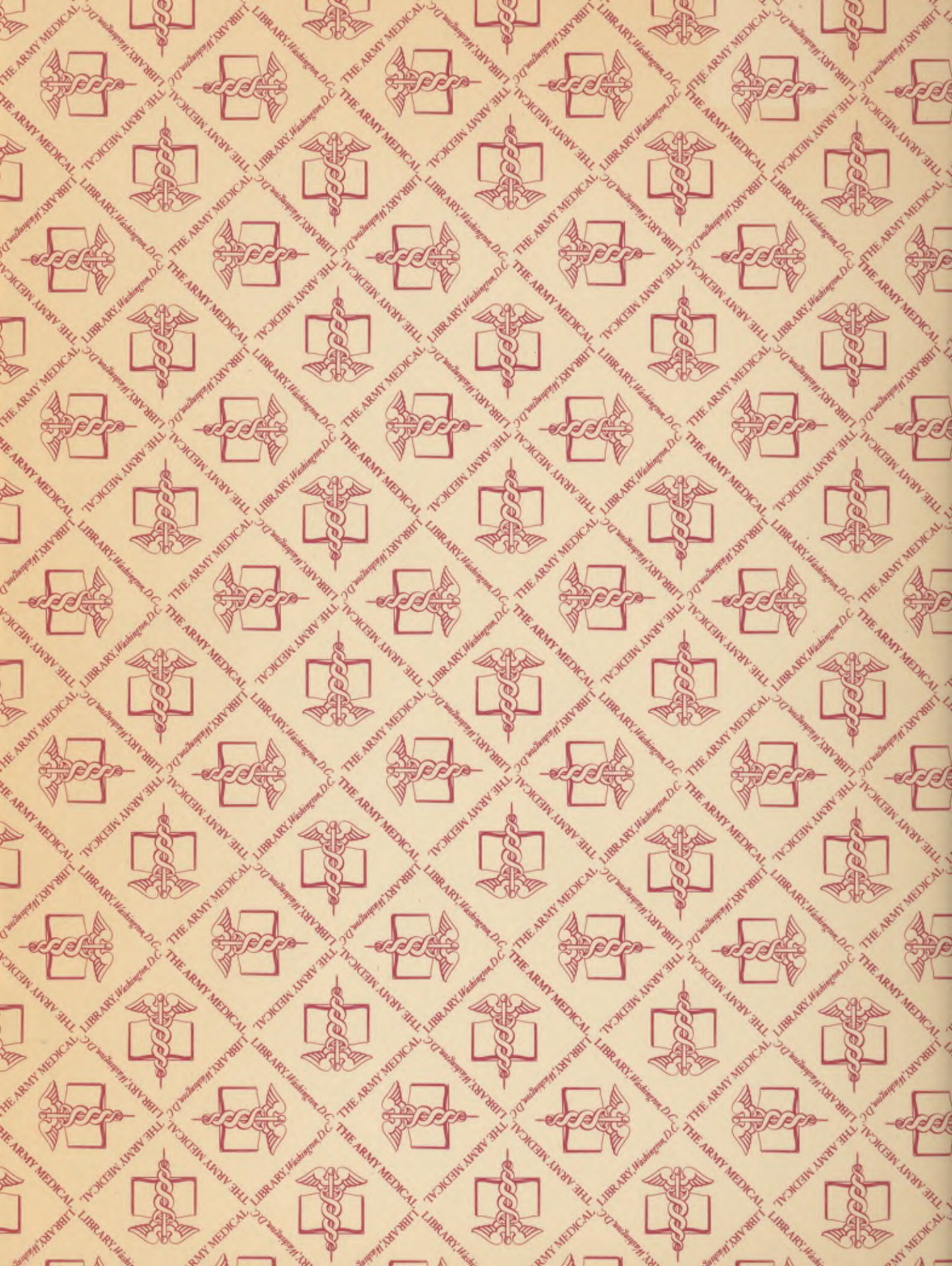
Wright Aeronautical Corp.
Woodridge, N. J.

Yoh, H. L., Co.
Philadelphia, Pa.

APPENDIX III

KEY TO ABBREVIATIONS

ADD	-	Air Documents Division
ADRC	-	Air Documents Research Center
AEC	-	Atomic Energy Commission
AMC	-	Air Materiel Command
APL	-	Applied Physics Laboratory, Johns Hopkins University
ASA	-	American Standards Association
ATI	-	Air Technical Index
BAGR	-	Bureau of Aeronautics General Representative
CAA	-	Civil Aeronautics Administration
CADO	-	Central Air Documents Office
CDI	-	Captured Documents Index
CVAC	-	Consolidated Vultee Aircraft Corporation
GE	-	General Electric Company
GM	-	Guided Missiles
IAS	-	Institute of the Aeronautical Sciences
IBM	-	International Business Machines Corporation
IP	-	Index Project (Captured Documents)
MIT	-	Massachusetts Institute of Technology
NACA	-	National Advisory Committee for Aeronautics
NEPA	-	Nuclear Energy Powered Aircraft
NME	-	National Military Establishment
NOTS	-	Naval Ordnance Test Station
ONR	-	Office of Naval Research
OTS	-	Office of Technical Services
RCA	-	Radio Corporation of America
SAIS	-	Standard Aeronautical Indexing System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