50

YEARS OF INFORMATION FOR DEFENSE

The Story of the
Defense Technical Information Center

1945 - 1995

The Story of the Defense Technical Information Center

by Lane E. Wallace

1945-1995

ACKNOWLEDGMENTS

To capture 50 years of history in a single document is a challenging task, and it requires the cooperative efforts of many people.

This book would not have been possible without the assistance of literally dozens of present and former employees and customers of the Defense Technical Information Center and its predecessor organizations who took time out of busy schedules to share their memories and knowledge with me. Staff members in the Special Programs office also patiently and persistently tracked down difficult-to-find phone numbers, reports, documents, and photographs that were necessary for the project and coordinated the book's layout and publication. In addition, I am indebted to the current and retired managers who willingly reviewed drafts of the manuscript to ensure its accuracy. A special note of thanks, however, is owed to DTIC's Administrator, Mr. Kurt Molholm and to Deputy Administrator, Mr. R. Paul Ryan. Without their vision, support, and involvement, this book never would have been created.

Over the past 50 years, the main commodity of the Defense Technical Information Center may have been information in all of its various paper, film, and electronic forms, but the critical component of the organization has always been its people. This book could not have been completed without them. And nothing the Center has accomplished in the last half century could have been achieved without the individual and collective efforts of the people who worked there. In recognition of their contributions, this book is respectfully dedicated to all the employees of the Air Documents Research Center, the Air Documents Division, the Central Air Documents Office, the Armed Services Technical Information Agency, the Defense Documentation Center, and the Defense Technical Information Center.

Lane E. Wallace

Los Angeles, California
July 1995

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PREFACE

Kurt N. Molholm
Administrator

In 1995, the Defense Technical Information Center (DTIC) celebrates 50 years of excellence in information service to the Department of Defense and, by extension, to the Nation. The writing of this commemorative history was undertaken to pull together into one volume the story of that service: to relate how the Center began, how it evolved into what it is and, further, to suggest what we believe the future may hold for DTIC.

The DTIC 50th Anniversary History is based on diverse sources, including internal documents of the Center and its predecessor organizations, as well as published documents in both the Technical Reports collection, pictorial archives, and the open literature. Just as importantly, it draws upon the interviews with many persons who themselves participated in the events, technological advances, and policy-making decisions that were significant in the evolution of the Center.

DTIC was established in 1945 as the Air Documents Division to collect and catalog World War II scientific and technical documents (including those captured from Germany and Japan). Today we are the central facility for the Department of Defense in the acquisition, storage, retrieval, dissemination, and use of scientific, technical, and engineering information. DTIC serves as the vital link in transferring such data among the defense-related government and civilian research and development communities. The military, universities, managers, scientists, engineers, and contractors look to us for leadership in the advancement of information access and sharing. For the United States to maintain its readiness and competitiveness with the industrialized nations, such scientific and technical information must be readily available and easily transferable. Using the latest computer and communications technologies, we provide annually nearly 1 million documents and research and development management information summaries to our users, in addition to more than a half-million online queries of our databases.

While in 1995 we are celebrating 50 successful years, we are, more importantly, looking forward to the next 50 years. We will continue to expand our data collection and enhance our information dissemination capabilities, including increased use of the Internet. We will continue to identify and define the interests and information needs of our users and to exploit technologies that will quickly locate and deliver the vital data our increasing number of users require, in the format that best suits their needs. And we will continue to play a prominent role in information management in the Federal Government and to make a vital contribution to the national defense as the custodian of recorded DoD scientific and technical advancements.

R. Paul Ryan
Deputy Administrator

DEFENSE TECHNICAL INFORMATION CENTER

Acquisition, Storage, Retrieval, and Dissemination of DoD Scientific and Technical Information

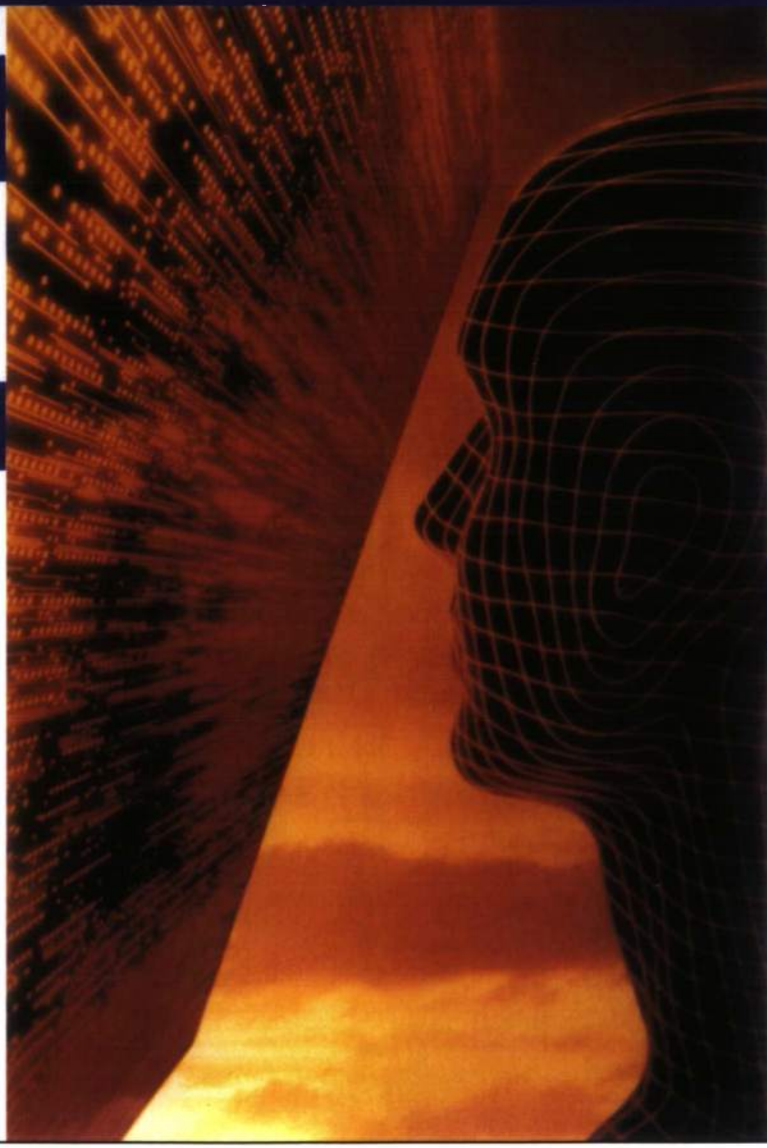
DTIC'S PRODUCTS KEEP YOU CURRENT

- Current Awareness Bibliography
- Automatic Document Distribution
- Recurring Reports

CONTRIBUTORS

- DoD Funded:
  - Laboratories
  - Schools
  - Analysis Centers
  - Studies Programs
  - Contractors
- U.S. Government Agencies
- Foreign Governments

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA



DTIC SBIR PRODUCTS AND SERVICES

- Ten technical reports provided free
- Additional information services and public domain documents available
- Support of Small Business Technology Transfer (STTR) Program

USER COMMUNITY

- DoD Components
- DoD Contractors and Grantees
- Potential Defense Contractors
- Historically Black Colleges and Universities
- University Research Support
- Small Business Innovation Research
- Other U.S. Government Agencies
- Other U.S. Government Agencies' Contractors and Grantees

INTRODUCTION

Knowledge is power. The truth of this statement has been recognized for centuries by all kinds of leaders, from battlefield commanders of a thousand years ago to executives in modern-day corporate boardrooms. Knowing what an opponent is planning, what techniques have proven most effective, or what innovations are available can provide a person, group, or armed force with a critical edge that can spell the difference between victory and defeat.

The United States received a sharp reminder of this fact during World War II, when it found itself years behind the Germans in technological knowledge. While the U.S. was still building piston-powered, propeller-driven fighter aircraft, the Germans had developed guided missiles and jet engine technology that could have proven disastrous for the Allied war effort. Fortunately, a series of poor decisions made by the German High Command delayed the implementation of some of this technology, but the U.S. realized the potential danger of falling behind in this knowledge and vowed not to let it happen again.

Ironically, some of this technological information was available to U.S. scientists before the war, but the scientists had no centralized organization or means to help them locate it. In 1934, for example, a patent for a rocket propulsion unit was filed with the U.S. Patent Office. The patent was taken out by a German scientist named Paul Schmidt, and this same engine was later found in the German V-1 Buzz Bombs. United States scientists, however, were unaware of the patent's existence and, therefore, could not exploit the technology.[1]

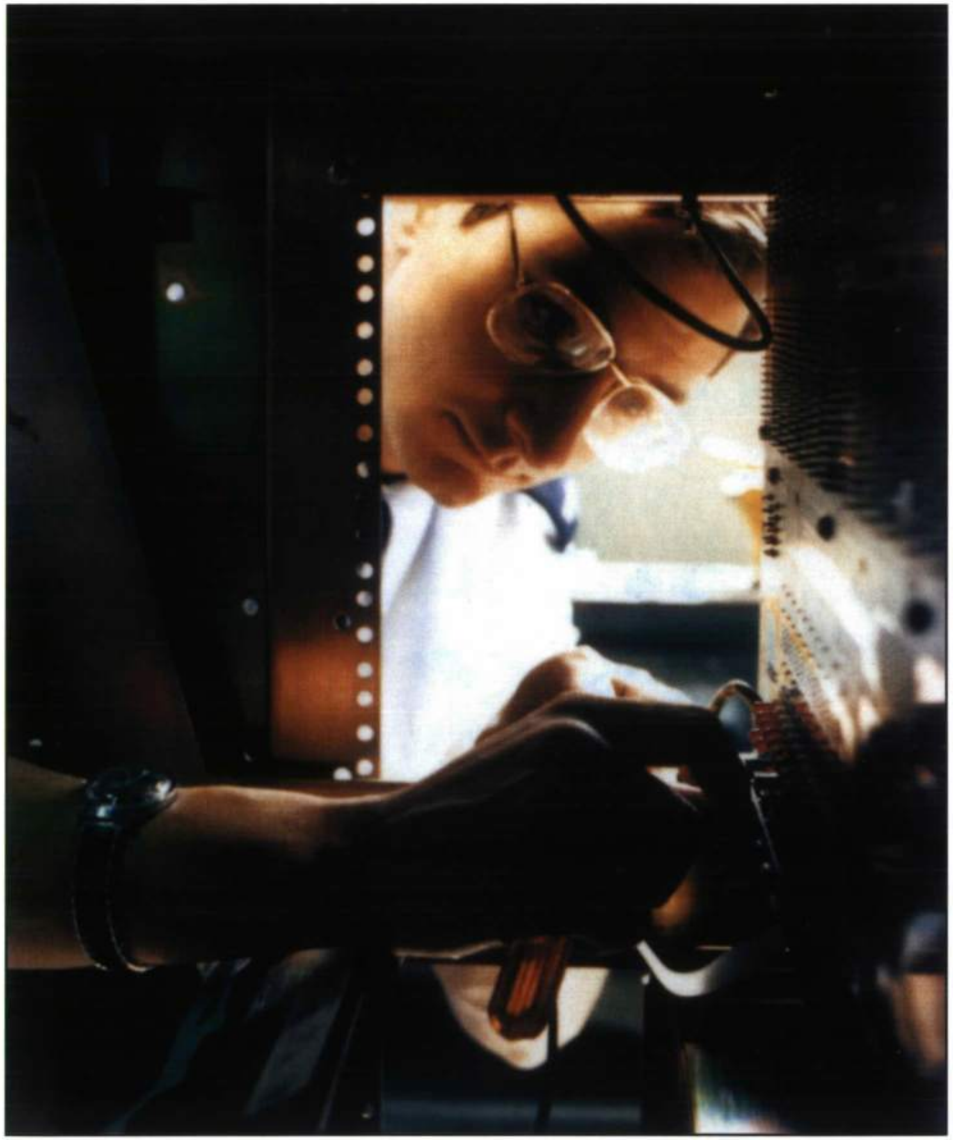
Realizing the power the Germans' advanced technological information represented in the ongoing battle against Japan, the Allied Forces sent teams of men right behind the front-line troops as they advanced into France and Germany to find and bring back the German scientists and their secrets.

Scientists and military leaders also realized that in order to prevent the U.S. from falling so dangerously behind in technological innovation and knowledge again, scientists and engineers had to have better access to this kind of information. To accomplish this goal, they concluded that a central index and repository of technical information was needed. Thus was born the first predecessor organization to what is now known as the Defense Technical Information Center (DTIC).

Fifty Years of Change

In the 50 years since that time, the world has undergone a tremendous amount of

Exhibit displays the diversity of products and services that are available from DTIC in 1995.



Scientists and engineers need technical information to avoid duplication of effort and build upon previous research.

change, and no area has been more affected than the field of information. In fact, U.S. society itself has gone from one based on industry to one based on the creation and distribution of information. Capital is no longer a strategic resource—knowledge is. In 1982, management consultant Peter Drucker argued that

> *The productivity of knowledge has already become the key to productivity, competitive strength, and economic achievement. Knowledge has already become the primary industry, the industry that supplies the economy the essential and central resources of production.*[2]

If anything has changed in the years since then, it is only that decision-makers in the government and industry need knowledge and information from a much greater variety of sources, and they need it fast. During WWII, access to technical information was seen as critical to maintaining military superiority. While this is even more true today, that information is now also seen as critical to maintaining U.S. competitiveness in an increasingly global market. Without that competitive edge, U.S. industry will suffer, making it less able to provide the technology and weapons systems needed for a strong national defense.

Technological Advances—Computers and Information

Technological advances in the last 50 years have also dramatically changed how information can be accessed and distributed. In the early post-WWII days of supersonic aircraft research at the Muroc Air Force Base in California, "computers" were staff people who manually computed the data from flight tests. The label seems laughable today. But even when the first machine computers became operational, no one could have guessed how they would one day transform society.

Until 1980, there were approximately 1 million computers in existence, according to computer manufacturer Commodore International Limited. By contrast, Commodore expected to sell at least that many machines in 1982 alone;[3] and the computer technology and advances of the 1980s have since been dwarfed by the quantum leaps made in the field in the last 5 years. With the development and exponential growth of the

In the early years, stacks of documents were reviewed for selection, then entered into the collection.

Internet and the much heralded Information Superhighway, people have gained instant access to an overwhelming amount of information from around the world.

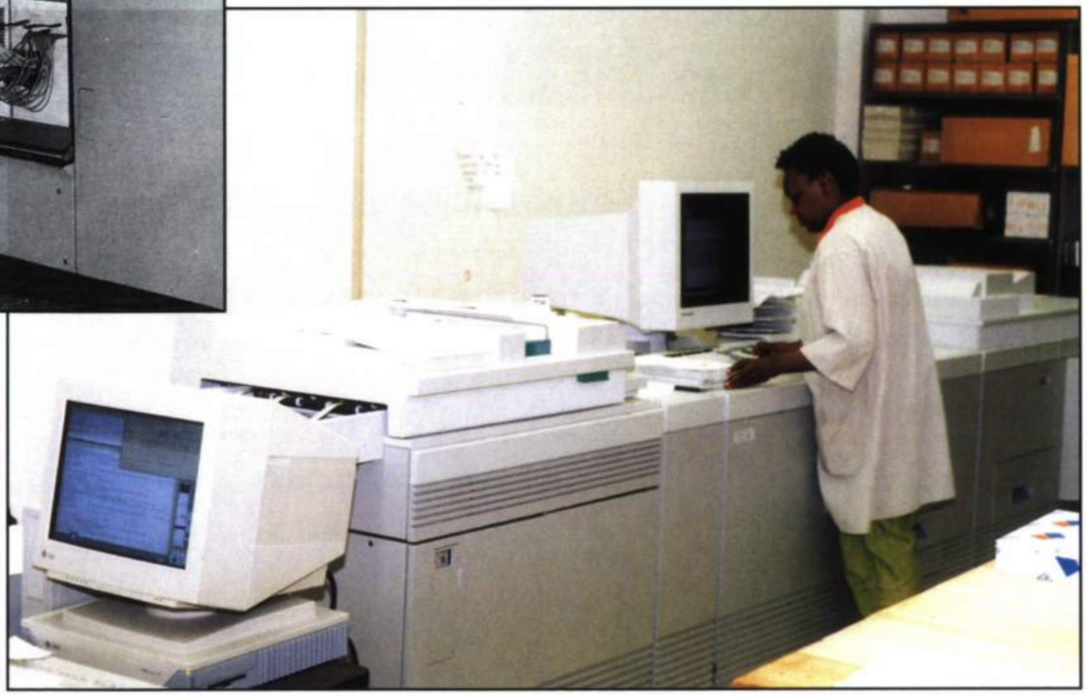
DTIC and the Age of Information

The electronic information age is changing the dynamics of information science from a local service based on supply to a global system based on selection. The problem has suddenly become not one of accessibility but of finding a particular, relevant drop of information in an ocean of available data; and the revolution is not yet completed. In fact, the information revolution has been more of an evolving process that began in the 1950s and is simply continuing at a faster pace today.

Perhaps it is not surprising, then, that the history of DTIC also parallels and illustrates the history of this evolving information revolution. DTIC started as a repository filled with stacks upon stacks of technical reports and catalog cards. It broke new ground in the early 1960s when it acquired some of the earliest computers to begin automating its tasks. In the early 1970s, it was on the leading edge of online computer technology with the development of its secure system for accessing classified and unclassified information. By the 1980s, DTIC was expanding into multimedia products, and now, in its 50th year of operation, it is entering a new age of computer networking and electronic documentation where paper documents are not even required.

Cataloging cards were produced manually at ASTIA in the 1950s.

This punch card sorter, programmed with a plug board, was part of the automated data processing system from the mid-1960s through the early 1970s.



Melvina Fountain operates the Xerox DocuTech as part of the document scanning process in the 1990s.

DTIC has also seen the scope of its mission change and expand repeatedly over the course of its history. When it began, its mission was only to collect and index captured German aeronautical documents. That mission was expanded to include all aeronautical documents and then to all technical documents pertaining to defense-related research. As the information needs of the Department of Defense (DoD) have changed and grown, DTIC has further expanded its services and products.

But no matter how it was carried out, the role fulfilled by DTIC and its predecessors has remained an extremely important one. In 1960, Dr. James R. Killian, Jr., Special Assistant to the President for Science and Technology, argued that

> *Our very progress in science is dependent upon the free flow of scientific information, for the rate of scientific advance is determined in a large measure by the speed with which research findings are disseminated among scientists who can use them in further research.*[4]

This has certainly remained true. Furthermore, as early as 1948, Secretary of Defense James Forrestal realized the economic need for better information dissemination to prevent duplication of effort and wasted resources, noting that

> *...nowhere is there a greater need for unity of purpose and effort than in the area of research and development. The shortage of scientific and technical manpower, as well as the size and cost of research and testing facilities, make it imperative that both be utilized to the fullest advantage.*[5]

In the environment of 1995, with deficits, shrinking budgets, downsizing, and unfavorable balances of trade, this statement is even more valid. To remain competitive, both militarily and economically, the U.S. research and development (R&D) efforts must not only be successful but efficient and economical, as well. To do this, researchers, program managers, and decision-makers must make the best use of strategic resources, not the least of which is information.

DTIC has undergone many changes in the past 50 years—from seeking the secrets of the Buzz Bomb to exploring the world of the Internet. But whether it was reproducing documents on jury-rigged V-Mail machines or providing individual researchers with instant access to thousands of databases around the world, the importance of the role DTIC plays has remained the same. *Knowledge*—the product of accurate, timely, and relevant information—*is power*, and throughout all the years and changes, DTIC and its employees have never lost sight of that fact. Its methods, scope of services, and customers have evolved and changed, but DTIC has always been and will remain dedicated to providing that lever of power to help the U.S. maintain a competitive economy and a strong national defense.

Since the beginning, the information in DTIC's collection has been applied to a strong national defense on the land, on the sea, and in the air.

CHAPTER ONE

THE EARLY YEARS

World War II saw one of the most intense periods of technological progress in the 20th century. At the beginning of the war, several countries were still using biplanes in their fighter squadrons; by its end, Allied pilots were going up against the world's first jet fighter. The war effort also resulted in countless other innovations, including radar, guided missiles, and proximity fuses.

By the fall of 1944, the Allied Forces were working their way into Nazi-occupied territories, and among the spoils sought by the Allied commanders were the secrets of the German scientific and technical community. The war in Europe might be nearing its end, but the U.S. was still facing what was anticipated to be a bitter fight with the Japanese, and it was hoped that some of Germany's advanced secret technology could be used in the Pacific theater.[6]

ATI Teams Recover Valuable German Technology

Nearly 1,500 Air Force Air Technical Intelligence (ATI) teams followed behind the front-line troops, searching for aeronautical research materials. The retreating Germans had instructed their scientists and engineers to destroy all records of their work, but many researchers, unwilling to see their lifetime efforts wiped out, had chosen to hide the documentation instead. Some of the hiding places were quite ingenious, but so were the ATI teams looking for the documents. Research materials were gathered from vaults of factories and laboratories, from pockets of refugees, under houses, in a German general's wine cellar, in cisterns, salt mines, and mountain caves, and even at the bottom of a 1,600-foot-deep mine shaft.[7]

A total of 1,750 tons of reports were eventually discovered by the ATI teams. Estimates of the monetary value of the research contained in the captured documents varied widely, from several hundred million dollars to 2 or 3 billion dollars. But even by the lowest estimate, the documents represented at least $200 million worth of aeronautical research. Included in the documents were items such as the design details for the Messerschmidt-262 jet fighter that Germany had introduced at the end of the

Soldiers enter a German city devastated by Allied bombing. ATI teams followed front-line troops in search of aeronautical research materials.

war, all the design, production, and test information necessary to build V-1 and V-2 guided missiles, and thousands of other innovations. The Germans were developing a swept-back wing for supersonic flight, formulas for synthetic rubber to make airplane tires, a jet-aircraft ejection seat, 138 different types of guided missiles, and a jet-powered bomber/reconnaissance aircraft capable of flying faster than 500 mph.[8]

London-based Air Documents Research Center—The Index Project

After an initial sorting, 250 tons of documents were flown back to London where, by June of 1945, the U.S. Army Air Forces (USAAF), the U.S. Navy, and the British Air Ministry had established an Air Documents Research Center (ADRC) to process the information. The Center was located in a six-story apartment building at 59 Weymouth Street. The USAAF put Colonel H.M. McCoy in charge and assigned him a staff of 25 scientists and engineers from the U.S. to analyze and categorize the captured documents.

Initially, the primary military objective had been to obtain technical information that could help the Allied war effort. In fact, the first ATI teams were sent out in search of the German scientists themselves, because the Allies assumed the research documentation would have been destroyed. But as the teams began uncovering intact, printed documentation, Dr. Theodore von Karman, one of the chief researchers involved with the project, realized they were holding a potential gold mine of information. He suggested to General H.H. "Hap" Arnold, Commander of the USAAF, that they attempt to catalog and index all the captured documents in order to create an accessible database encompassing the entire science of German aeronautics. Arnold agreed, and the result was the highly secret Index Project, which represented a pioneering effort to create a centralized record of an entire field of both classified and unclassified information.[9]

The biggest problem the ADRC staff faced in carrying out the Index Project was one of sheer volume. Documents were arriving daily by the ton—so many that they were simply shoveled off the trucks onto scales and counted by weight instead of number. Just sorting the documents was a monumental

Messerschmidt Me-262A-12. This is one of the few remaining original Messerschmidt-262 jet fighters.

Photo courtesy of Plane's of Fame Museum, Chino, California

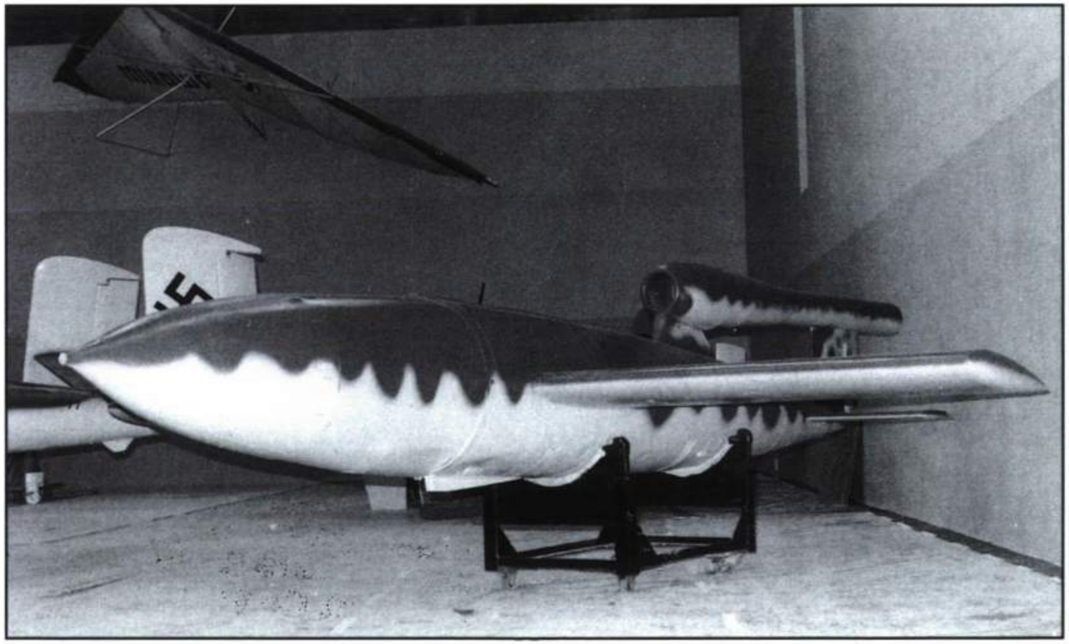


Photo courtesy of Plane's of Fame Museum, Chino, California

German V-1

In 1945, Col. H. M. McCoy was in charge of the Air Documents Research Center (ADRC) in London. The Center was established to analyze and catalog captured German documents.

task. Nontechnical material was separated out, and the staff quickly organized the remaining documents by source—meaning the research institution or industry laboratory that had conducted the research. On an average day, the staff screened and sorted four or five tons of documents in this manner.

ADRC Evolves into the Air Documents Division

There was, of course, tremendous time pressure on the ADRC staff, as well, because if the information contained in the documents were to be of use to the U.S. in the war against Japan, it needed to be disseminated to military and industry researchers as quickly as possible. To speed up getting information from some of the highest priority documents back to the U.S., the ADRC staff initially microfilmed existing index cards from Germany's Center for Scientific Information on Aeronautical Research (ZWB). The Center had been established in 1933 and contained documents on much of the German aeronautical research conducted from that time until the end of the war.

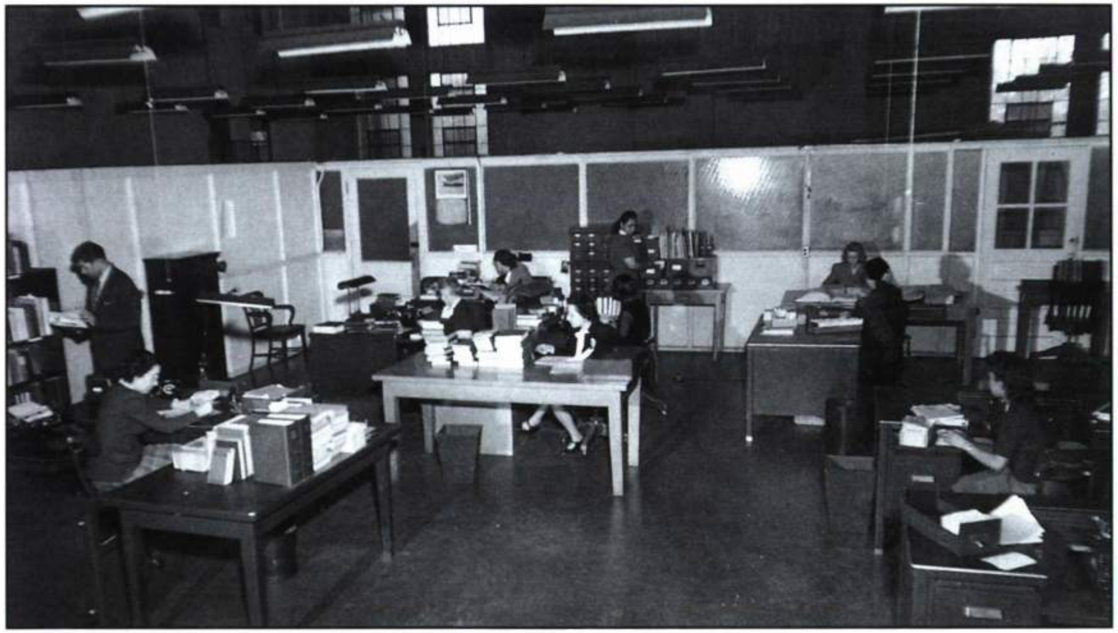
After shipping this microfilm to the U.S., the next priority was translating the ZWB cards into English. This task was not as easy as the staff anticipated, however. First, the people doing the translations had different levels of fluency in the German language. Second, the Nazis had worked at purifying their language, so even personnel who had done graduate work in Germany before the war had difficulty understanding the documents. Third, because much of the research pertained to new areas of knowledge, some of the research concepts simply lacked equivalent English terms.[10] These difficulties led Dr. Kurt Leidecker, one of the researchers working on the project, to compile a dictionary of German aeronautical terms. This dictionary turned out to be a valuable side benefit of the Index Project.

The staff at the ADRC also faced the problem of creating a cataloging system for the documents despite the fact that none of them were librarians or had experience in effective cataloging or indexing methods.

Building 12 at Wright Field housed the Library Section of the Air Documents Division (ADD).

Consequently, they ended up creating their own library system from scratch. To divide and organize the thousands of documents piling up in their offices, the team held a series of catalog-heading brainstorming sessions where the ADRC personnel wrote on cards all the possible subject headings they could think of. These cards became the first official subject-heading list for the collection.[11]

By the fall of 1945, the military efforts in Europe were winding down, and the decision was made to move the document-cataloging effort back to the United States. Offices were set up at Wright Field at Dayton, Ohio, and the ADRC became the Air Documents Division (ADD) of the Intelligence (T-2) Department of the Headquarters, Air Technical Service, Army Air Force. By December 1945, some 800,000 documents had been flown to Wright Field. The ADD, while under the management of the Army Air Force, was actually still a joint effort with the U.S. Navy, which opened a liaison office for its Bureau of Aeronautics at Wright Field to assist with the operation.



The staff of the ADD catalogs captured German and Japanese technical documents.

U.S.-based Air Documents Division Completes Original Mission

The job of the ADD was to complete the job started by the ADRC in London. The ADD staff was to screen, catalog, abstract, index, announce, and selectively disseminate the captured documents, which now also included captured Japanese technical reports. Since the war was over by this time, there was not the same critical time pressure that the office in London had faced, so the ADD staff was able to set up a more detailed and organized processing procedure. Documents were sorted under subject headings, assigned a file code number, abstracted, and indexed by heading, title, author, and source. A special Translation Section of ADD was also set up to translate many of the reports.

Staff members from ADD's Production Control Branch hold placards describing their service sections during a 1947 briefing.

For the next 2 years, the ADD staff worked at cataloging the captured documents and translating a small number of reports that covered high-priority research. As work progressed, the staff sent out batches of new catalog cards to companies and research centers. They also sent out copies of specifically requested documents, which were usually still in German. The staff provided bibliographic searches for approved users as time permitted, but the workload was such that very few searches could be done. Consequently, representatives from many of the major companies involved in aeronautical research, development, and production became frequent visitors to the ADD offices in Dayton. On-site visits were the quickest and most effective method companies had for searching the latest cataloged and/or translated documents and requesting copies of relevant reports.[12]

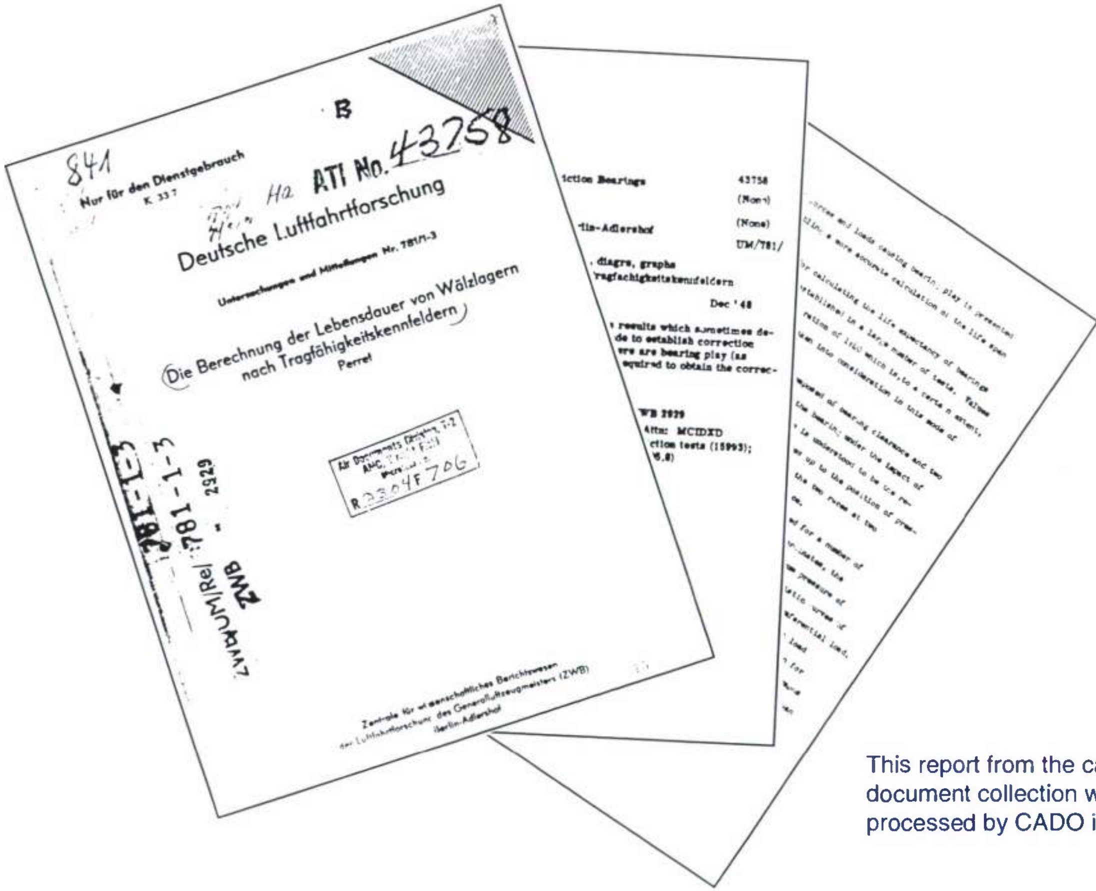
Over the course of the next 2 years, the initial 800,000 documents were reduced to a group of approximately 56,000 German documents and 3,000 Japanese reports that were deemed to contain important aeronautical research information. During that same time, over 10 million Captured Documents Index (CDI) cards were distributed to 35 locations that maintained indexes to the collection, and hundreds of thousands of reports and microfilms were distributed to approximately 2,500 government agencies and contractors.[13]

By November 1947, 14 months ahead of schedule, the ADD had completed the CDI. The information in the index was available both in card catalog form and in a printed *Desk Catalog of Captured German and Japanese Air Technical Documents*. The finished products were impressive both in size and scope. A full set of CDI cards consisted of 300,000 separate cards, and the catalog required six volumes, each two inches thick.[14]

The initial job for which the ADRC/ADD had been established was completed. But researchers and military officials alike were beginning to realize that to maximize the U.S. aeronautical research and development effort, it was important to know not only what the Germans and Japanese had been doing but also what other researchers in the U.S. were working on or had discovered.

Birth of the Central Air Documents Office

On October 13, 1948, the Secretaries of the Navy and the new U.S. Air Force officially redesignated the Air Documents Division as the Central Air Documents Office (CADO). In addition to taking over the captured documents collection, CADO was given control of nearly 250,000 U.S. technical reports that had been collected at Wright Field since World War I.[15] But more importantly, the new office was given a much broader mission. CADO became the official documentation agency for the Air Force, tasked with collecting, processing, and disseminating on a selective basis and within the provisions of military security regulations, all air technical data, past and present, domestic and foreign, for the benefit of the military establishment.[16] Obviously, this expanded mission would create a much larger library of documents. It also meant that instead of simply cataloging and managing a collection of documents already in the hands of the agency, CADO now would have



This report from the captured document collection was processed by CADO in 1948.

to locate and obtain documents pertaining to aeronautical research, as well.

In order for such an ambitious concept to succeed, the CADO staff and its military supervisors realized that three things were needed: (1) an effective cataloging system, (2) an announcement vehicle to publicize what information was available, and (3) an effective retrieval and distribution system to allow researchers to obtain information quickly. The cataloging system set up under the ADD provided a good basis for cataloging what was now envisioned as an ever-expanding collection. But disseminating the documents posed more of a challenge.

In the late 1940's, Eugene Jackson (center) was the Chief Librarian. Col. A.A. Arnhym (left) was the Chief of CADO and Cdr. Munson was Deputy Chief.

Appropriate Dissemination of Information

Dissemination of the information gathered by CADO was a complex problem because of the sensitive nature of the material. Much of it was classified and was restricted to only those contractors and agencies with a legitimate need to know. There had been complaints with the CDI project that researchers had been overwhelmed with too much information, much of which was irrelevant to their work. This made it difficult to sort out those documents that might be of the greatest value. CADO had to devise a method of classifying both the researchers' areas of interest and clearance levels and the reports in the collection in order to match the two accurately and efficiently.

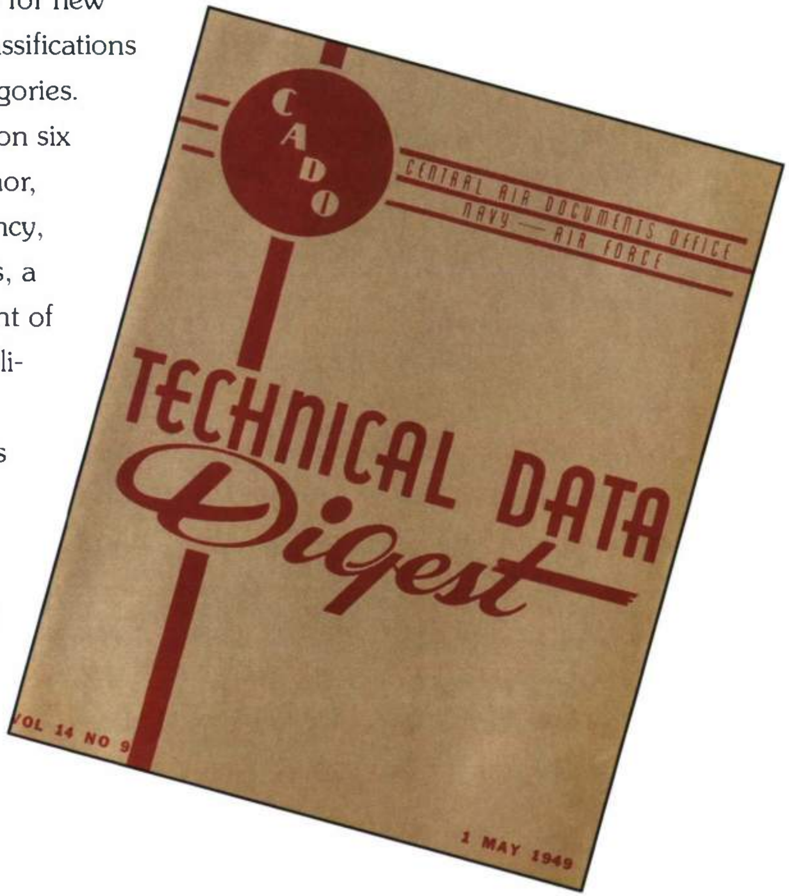
In fact, the Air Force and the managers at the ADD had realized the need for such a system even before the CDI project was finished. In the spring of 1947, CADO, the Office of Naval Research, and the U.S. Navy's Bureau of Aeronautics contracted with the Institute of Aeronautical Sciences

(IAS) to develop a Standard Aeronautical Indexing System (SAIS).[17] After consulting with hundreds of researchers in the field of aeronautics, the IAS began by breaking down the science of aeronautics into approximately 50 functional divisions or major areas. These divisions were then subdivided into more specific individual sections. For example, the Flight Testing Division included 10 sections, 2 of which were Methods and Techniques and Handling Characteristics.

Agencies or researchers interested in obtaining classified information from CADO had to supply their security clearance information and the divisions and sections of information they had been cleared to receive. Civilian contractors also had to supply the contract number under which they were working and have their SAIS approval verified by the military project officer who was working with the company. After the reports were processed, they were also indexed by the SAIS divisions and sections that applied to their subject content. When a request for a report was received by CADO, staff members would compare the SAIS information on the requester's registration card against the SAIS divisions and sections listed for the report. This method allowed CADO to make sure that an agency or researcher had been cleared not only for the appropriate security level of a given document, but for that area of information, as well.[18]

CADO let researchers know what documents were available through a new publication called the *Air Technical Index* (*ATI*). The *ATI* was created by reproducing sets of catalog cards on translucent sheets for new reports that had similar security classifications and SAIS division and section categories. Each sheet contained information on six documents, including the title, author, originating agency, publishing agency, subject headings, contract numbers, a short abstract describing the content of the report, and, of course, the applicable SAIS divisions and sections. Dividing the sheets of catalog cards into similar security classifications and SAIS categories allowed CADO to customize the *ATI* announcements so that agencies received information only on documents that were relevant and appropriate for them to access.[19]

CADO also resumed publication of the *Technical Data Digest* in 1947 to announce information about unclassified, published material. The *Digest* dated back to 1926,



CADO's *Technical Data Digest* contained abstracts and reviews of published papers.

when Air Corps engineering personnel began publishing a *Technical News Service* at McCook Field in Dayton, Ohio. The publication had been renamed the *Technical Data Digest* in 1932 and was produced regularly until December 1945, when the workload from the captured technical documents project and other demobilization tasks caused the staff at Wright Field to discontinue the publication. CADO's *Digest* included abstracts and reviews of papers from a wide variety of national and international professional journals and magazines, and a new edition was released every two weeks.[20]

Document Processing, a Manual Procedure

Although there were some mechanized aids used by the CADO staff in processing documents and reference requests, most of the tasks were still entirely manual, making both document processing and dissemination extremely labor intensive. Furthermore, these jobs had been subdivided into small, individual tasks that could be accomplished by nonprofessional personnel. This pipeline system allowed the use of lesser skilled employees, but it also meant that processing or researching and reproducing a document involved a great many people and steps.

When a document was received at CADO, it was logged in by personnel in the Acquisition Branch. It was then routed to the Document Processing Section, where staff members checked it to make sure it was not a duplicate of a document already in the collection. Each agency and department that funded the research was assigned a number, and for each report, a card was filed under both numbers. After going through both of those files, the report was then checked against an author file, as a final cross-check.

If the document was not a duplicate, it was then sent to a Reading Panel of qualified engineers to see if it contained information of general air interest. If it did, the Panel assigned SAIS division and section codes to the document and forwarded the document on for further processing. Next, staff members recorded the standard descriptive cataloging information for the document, such as title, author, originating agency, and number of pages. This information was typed onto a ditto sheet, which was then used to create various file cards pertaining to the document, including the file cards for the duplication check files, inventory control cards, and library research.

The document was then reviewed for military security classification before being given to an analyst qualified in the field who would write a short abstract for it. Subject headings for indexing purposes were assigned to the report and entered on the ditto processing sheet. The information needed to create an ATI card for the document was then retyped onto an ATI sheet and sent to layout and printing. Next, the document and the processing sheet were microfilmed page by page, along with a copy of the catalog card information contained on the processing sheet. Both the microfilm and the document were then filed in ATI number sequence.

For reference purposes, each document filed in the ATI collection was indexed under a total of 11 types of catalog cards—5 for subject headings, 2 for its originating and publishing agencies, 3 for personal author files (since many reports had multiple authors), and 1 for the ATI number. Placing these 11 sets of cards into the ATI files took a total of 18 separate operations.

The staff works in the extensive microfilm files.

Each request for a document was received by the Document Requirements Section. A staff person there first checked the request against registration files to see if the requester had a security clearance at least as high as that of the document and had been cleared to receive information in the SAIS divisions and sections covered by the report. If the request was verified as valid, another staff member checked to see whether CADO had the document. If the report was in the ATI collection, the request was forwarded to the Storage and Records Unit, which would furnish a hard copy of the document, if it was available. If a hard copy was not available, the request was sent to the Publishing Section, where either a microfilm or printed copy was made.[21]

These workers transfer 35-mm film images to paper copy.

Document Reproduction—Three Options

Making any kind of copy in the days before photocopying (or Xerox) machines was not an easy task. The staff at CADO had three basic options for making copies of documents, none of which was ideal. First, they had rudimentary equipment known as Ozalid machines, which operated much like blueprint copiers. They made print copies from print originals, but the print quality was poor and the machines were slow. To copy one page through an Ozalid machine took 10 minutes.

It was not until the introduction of electrostatic reproduction machines in 1956 that making print copies of print documents became a feasible operation. An electrostatic reproduction method used a photograph of a printed page to create a paper master copy and used that master to reproduce any number of copies on an offset printing machine. These machines were the precursors of what became commonly known as Xerox copiers.[22]

Before that time, however, if a print copy of a technical report was requested, the CADO staff generally used an Airgraph machine—better known to WWII military personnel as a V-Mail machine, which enlarged full-size paper copies from microfilm. The process was wet and messy, but it was more efficient and produced better quality copies than the Ozalid machines. These machines were used until the early 1960s when they were replaced by Copy Flo machines, which used a much-improved dry process to create print copies from microfilm.

The third option at CADO was to make a microfilm copy from a microfilmed document by using ozaphane dry-film duplicating machines. Although the ozaphane duplicators were neater than the Ozalid machines, both used ammonia-based processes, which saturated the office with a distinctive ammonia smell. The smell was so strong, in fact, that it remained a vivid memory of employees years after they retired.[23]

Given the difficulty of the reproduction technology of the time, it is especially impressive that in Fiscal Year (FY) 1949, CADO managed to distribute 150,000 copies of reports, in addition to ATI sheets on 37,000 different documents. Further, between 1945 and 1949, the ADRC, ADD, and CADO distributed a total of 1,060,000 documents in print and microfilm form.[24]

An Intelligence Department/CADO display at the 1948 USAF Day, Wright-Patterson AFB.

As CADO broadened the scope of its work from captured documents to information on all foreign and domestic aeronautical research, the military began to reevaluate the office's organizational structure, as well. On June 1, 1949, CADO was separated from the Intelligence Department and established as an independent military agency under the administrative control of the Air Materiel Command and the policy guidance of the Research and Development Board. Funding for the agency was to be split by the Air Force and the Navy in proportion to how much each used its services. The biggest functional change resulting from the separation was the elimination of the translation duties that the office (under its different names) had performed since 1945.[25]

Scientists and administrative officials were also beginning to realize that the scope of documents relating to aeronautics was broader than once envisioned. Dr. Karl Compton, Chairman of the Research and Development Board, estimated that 80% of all technical and scientific reports were relevant to aeronautics, while Dr. Theodore von Karman, who had helped launch the initial index project, was of the opinion that all fields of scientific research were of interest to the science of aeronautics.[26]

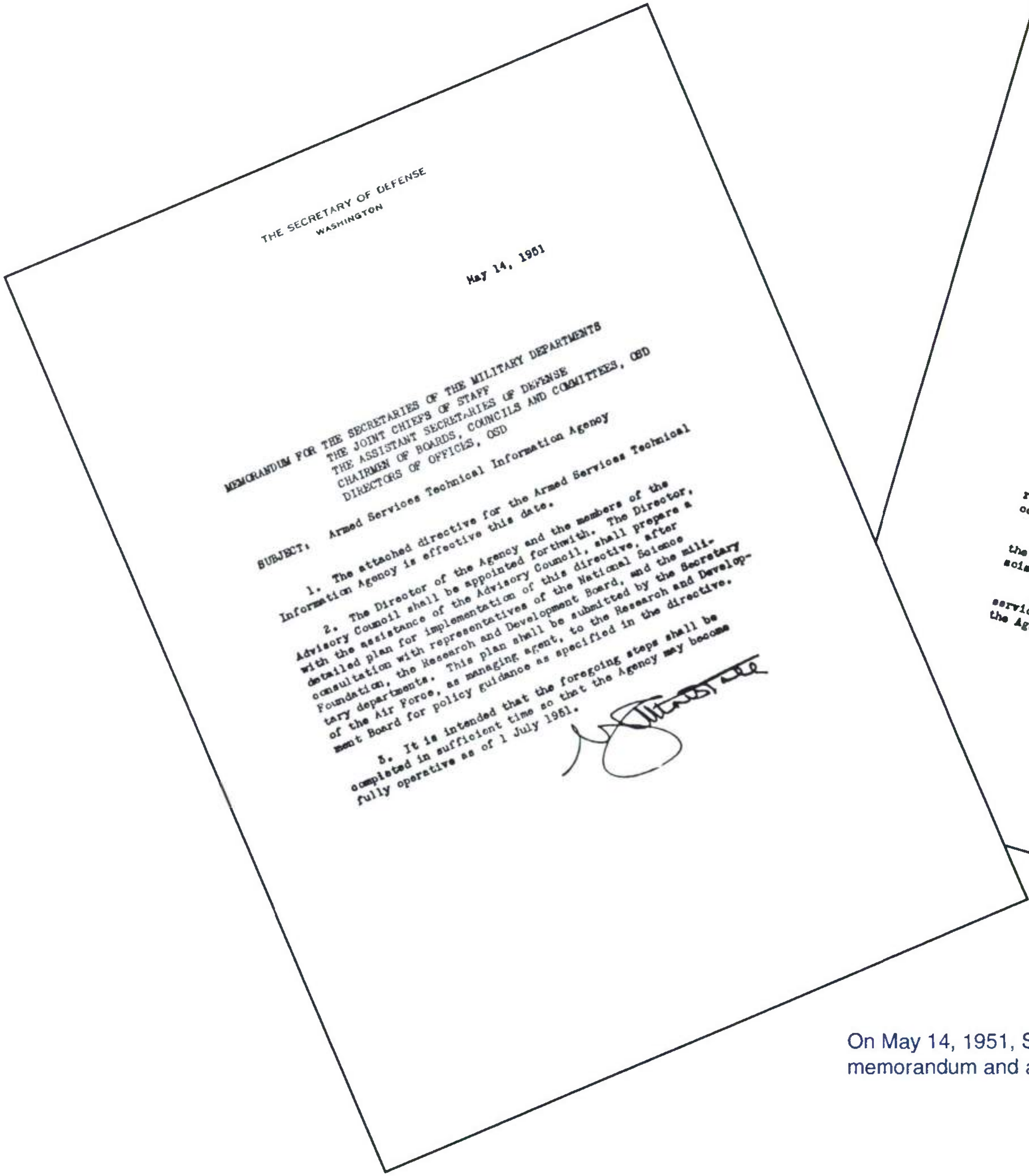
As decision-makers began to take a broader view of the agency's scope and services and realized the benefits a centralized technical database could provide, additional organizational changes were made. In January 1950, CADO became an official Armed Forces organization, with the addition of an Army member to the joint administration office. Then on May 14, 1951, Secretary of Defense George C. Marshall issued a directive establishing the Armed Services Technical Information Agency (ASTIA). The directive stated that

> *...the decision to launch this undertaking was based upon recognition of the fact that the end product of all Department of Defense sponsored research and development—i.e. the recorded conclusions—costing vast sums of money and irreplaceable scientific effort, must be assembled, organized, preserved, and made available for future reference by those concerned with exploring and guarding the scientific frontiers of the Nation.*[27]

CADO Renamed ASTIA Document Service Center

On January 1, 1952, ASTIA took over the operation of CADO, which was renamed the Armed Services Technical Information Agency (ASTIA) Document Service Center. On May 6, 1953, the Naval Research Section (NRS), which was operating in the Library of Congress in Washington, D.C., was also brought under ASTIA control and renamed the ASTIA Reference Center. The NRS had its origins in the Office of Scientific Research and Development (OSRD), which was formed in 1941 and produced over 30,000 technical documents. After the war,

The Micrographics Staff of ASTIA operates a diazo roll-film duplicator and microfilms technical reports in 16-mm and 35-mm formats.



THE SECRETARY OF DEFENSE
WASHINGTON

May 14, 1951

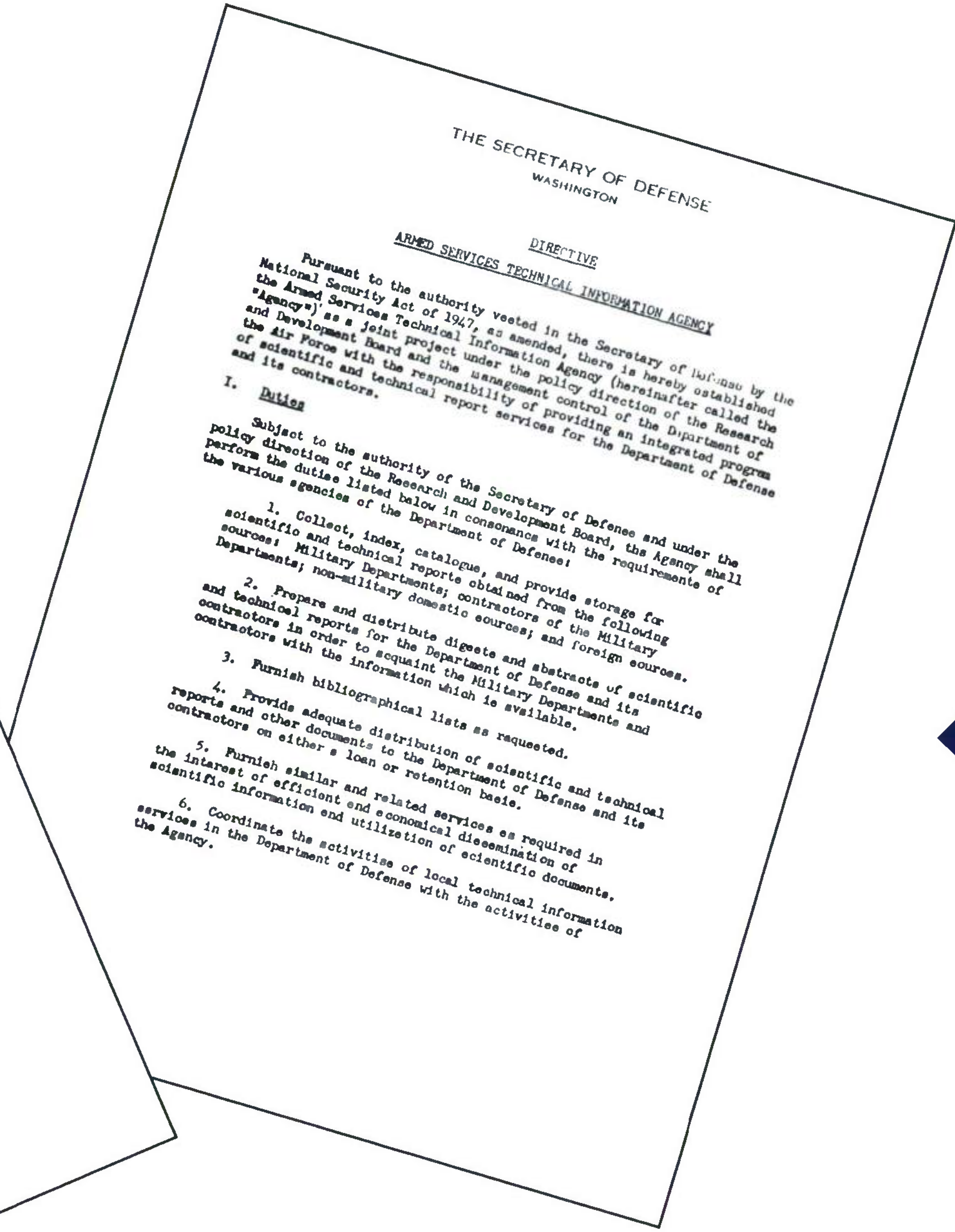
MEMORANDUM FOR THE SECRETARIES OF THE MILITARY DEPARTMENTS
THE JOINT CHIEFS OF STAFF
THE ASSISTANT SECRETARIES OF DEFENSE
CHAIRMEN OF BOARDS, COUNCILS AND COMMITTEES, OSD
DIRECTORS OF OFFICES, OSD

SUBJECT: Armed Services Technical Information Agency

1. The attached directive for the Armed Services Technical Information Agency is effective this date.

2. The Director of the Agency and the members of the Advisory Council shall be appointed forthwith. The Director, with the assistance of the Advisory Council, shall prepare a detailed plan for implementation of this directive, after consultation with representatives of the National Science Foundation, the Research and Development Board, and the military departments. This plan shall be submitted by the Secretary of the Air Force, as managing agent, to the Research and Development Board for policy guidance as specified in the directive.

3. It is intended that the foregoing steps shall be completed in sufficient time so that the Agency may become fully operative as of 1 July 1951.



THE SECRETARY OF DEFENSE
WASHINGTON

DIRECTIVE

ARMED SERVICES TECHNICAL INFORMATION AGENCY

Pursuant to the authority vested in the Secretary of Defense by the National Security Act of 1947, as amended, there is hereby established the Armed Services Technical Information Agency (hereinafter called the "Agency") as a joint project under the policy direction of the Research and Development Board and the management control of the Department of the Air Force with the responsibility of providing an integrated program of scientific and technical report services for the Department of Defense and its contractors.

I. Duties

Subject to the authority of the Secretary of Defense and under the policy direction of the Research and Development Board, the Agency shall perform the duties listed below in consonance with the requirements of the various agencies of the Department of Defense:

1. Collect, index, catalogue, and provide storage for scientific and technical reports obtained from the following sources: Military Departments; contractors of the Military Departments; non-military domestic sources; and foreign sources.

2. Prepare and distribute digests and abstracts of scientific and technical reports for the Department of Defense and its contractors in order to acquaint the Military Departments and contractors with the information which is available.

3. Furnish bibliographical lists as requested.

4. Provide adequate distribution of scientific and technical reports and other documents to the Department of Defense and its contractors on either a loan or retention basis.

5. Furnish similar and related services as required in the interest of efficient and economical dissemination of scientific information and utilization of scientific documents.

6. Coordinate the activities of local technical information services in the Department of Defense with the activities of the Agency.

On May 14, 1951, Secretary of Defense George C. Marshall issued this memorandum and an attached directive establishing ASTIA.

the Office of Naval Research (ONR) was established and contracted with the Library of Congress to catalog and manage the OSRD documents. In 1949, the ONR documentation project became the NRS.[28]

The NRS had concerned itself with documents relevant to Navy interests, whereas CADO had dealt with aeronautical research fields. When the NRS and CADO were combined under ASTIA, however, each office became responsible for different aspects of processing, cataloging, announcing, and distributing relevant documents, instead of being responsible for different types of reports.

A new document coming into the collection, for example, would be sent to Dayton. It was logged in there and reviewed to make sure it was appropriate for the collection. If it was acceptable, copies of the document were sent to the ASTIA Reference Center at the Library of Congress, where the cataloging and abstracting tasks were completed.

Copies of the cards were then sent to Dayton, where they were used to create a *Title Announcement Bulletin* (*TAB*), which was published every two weeks and distributed to ASTIA users.

Research, Announcement, and Dissemination—A Collaborative Effort

The *Title Announcement Bulletin (TAB)* was very similar to the *ATI* sheets published by CADO or the equivalent *Technical Information Pilot* (*TIP*) announcement bulletin published by the NRS before it became part of ASTIA. Different versions of *TAB* were printed based on security classification. A user with a secret security classification would receive a version of *TAB* that included citations on all documents up to and including those on a secret level. The user would then know the titles of many other reports, but distribution of documents was limited to the need-to-know area, as defined through the SAIS divisions and sections.

Once the *TAB* was sent out, the Reference Center at the Library of Congress was responsible for conducting the majority of the bibliographic searches and reference requests

On the left, Paul Klinefelter and Herbert Rehbock of ASTIA show the document storage area to French visitors, on the right. DTIC and its predecessors have maintained information exchange agreements with certain foreign countries.

that came into the agency. Reproducing and shipping either the catalog cards for a bibliography or the documents themselves, however, was the responsibility of the Dayton office.

Clearly, the time delays inherent in this system were tremendous. If a naval document came into the Reference Center, it would first have to be sent to Dayton. Then it went back to Washington for abstracting, cataloging, and announcing. Reference requests for the document would be handled by the staff at the Library of Congress, but distribution of either the relevant catalog cards or a copy of the actual document was handled by the Dayton office.[29]

These logistical delays were compounded by the fact that the agency's workload was increasing rapidly. In the first 5 years of its existence, ASTIA experienced an incredible rate of growth. World War II had stimulated a much greater interest in technological research and development within the DoD and government in general. Decision-makers had realized the danger posed by the Germans' technological superiority in guided missiles and jet aircraft technology during the war, and the explosion of the atom bomb had underscored to the world how powerful a weapon technology could be. Future conflicts would be decided not by superior numbers but by superior technology.

One of ASTIA's regional offices was located in this building in Pasadena, California.

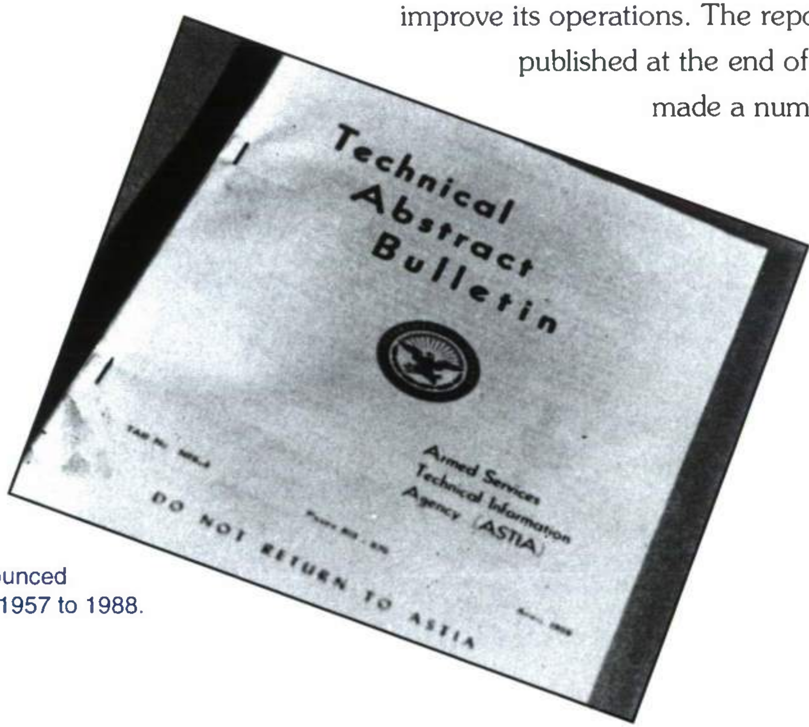
Not surprisingly, this focus on R&D led to increased funding for scientific and technological research. This, in turn, created an ever-expanding number of technical reports and documents on a wide variety of subjects. In 1949, the CADO collection occupied approximately 4,000 square feet of floor space; by 1956, that number had increased to 10,000 square feet, encompassing over 2 million print copies of documents. Approximately 34,000 new documents were added to the collection each year, and the number of new titles selected for announcement in FY 1956 was 20% larger than for FY 1953.

ASTIA Expansion

The demand for ASTIA's services had increased dramatically, as well. From FY 1953 to FY 1956, the number of requests processed by ASTIA personnel had increased 162%. The number of outgoing pieces of mail doubled during that same time, to an average of 600,000 a year. The number of catalog cards reproduced for users had grown from 8 million a year in FY 1953 to 23 million by FY 1956.[30] ASTIA had also expanded by opening a regional office in New York City in November 1952 and a San Francisco branch in July 1957.

Between the logistical difficulties caused by its two separate locations and the rapid increase in the size of its collection and demand for services, ASTIA was overwhelmed. By 1957, the average turnaround time for a report request was 44 days, if the document was unclassified and in stock, or 79 days, if it was classified and had to be reproduced and sent through a military project officer. A letter from the Boeing Airplane Company dated January 22, 1957, noted that of the 3,000 documents the company had requested from ASTIA in the preceding year, the delay in receiving the reports had been 43 days for unclassified material, 68 days for confidential material, and 114 days for secret documents. Delays in processing a new report into the collection were even worse. The average time for processing a new document in 1957 was 181 days.[31]

The increased demand for services was also causing a funding crisis for the agency. By 1957, ASTIA's budget was $2 million a year, but the agency had to request an additional $780,000 from Air Force R&D Emergency Funds to meet its obligations. To contain costs, ASTIA was ordered to discontinue all overtime and deny all requests for additional staffing. As a result, ASTIA was forced to curtail some of its services to users.



ASTIA, DDC, and DTIC announced new documents in *TAB* from 1957 to 1988.

To contribute further to the agency's difficulties, the Librarian of Congress notified ASTIA that the space being occupied by the ASTIA Reference Center was needed for other purposes. Consequently, the Library of Congress did not intend to renew its contract with ASTIA when it expired on June 30, 1957.[32]

Creation of the *Technical Abstract Bulletin*

In the spring of 1957, the Deputy Assistant Secretary of Defense for Research and Engineering ordered a management survey of ASTIA to see what could be done to improve its operations. The report, published at the end of June, made a number of recommendations to cut down on ASTIA's workload and streamline its functions. Recommendations involved relatively simple changes, such as including a short abstract with each document listed in the *Title Announcement Bulletin*. The idea was that if users had more information about the content of documents, they could narrow their requests to specific reports that were truly relevant to their work, thus reducing the number of inquiries the ASTIA staff had to handle and the number of reports they had to send out. This suggestion led to the creation of the *Technical Abstract Bulletin (TAB)* in September 1957; this was similar to the *Technical Announcement Bulletin* it replaced but included abstracts of the documents, as well. The new *TAB* was also published as a single, unclassified bulletin, instead of several different publications divided by security classification level.[33]

Other recommendations were more complex. Pointing out the impending cancellation of the Library of Congress contract, for example, the review recommended consolidating the two offices of ASTIA to reduce processing delay time and duplication of effort. ASTIA's management agreed that consolidation was a good idea, but finding an adequate location was difficult. A 6-month extension of the Library of Congress contract was obtained while ASTIA looked for a new home. The Washington, D.C., area was the logical place for a consolidated operation since it would be near many of the DoD and government agencies ASTIA supported, but adequate space there was hard to find. Finally, facilities were located at Arlington Hall Station, a military installation in Arlington, Virginia, just outside of Washington. On February 3, 1958, ASTIA moved into its new headquarters, using 80 trucks to transport its document collection.[34]

ASTIA Automation

The management survey of ASTIA also noted that ASTIA was not adequately mechanized to perform the different jobs of indexing, cataloging, referring, announcing, and releasing.[35] To keep up with the fast-growing demand for services without overburdening personnel or exceeding the funding available for the agency, ASTIA would have to automate many of its manual tasks. But by 1957, the technology to adequately accomplish this mechanization was not yet available.

This is not to say, however, that mechanism had not come to ASTIA. Punch cards and sorters to perform simple circulation functions had been in use in some libraries since 1936, and the ADD had used electronic tabulation machines to help create the original *Desk Catalog of Captured Documents*. But the capability of the equipment was extremely limited, and the process was crude and unwieldy.

To create the *Desk Catalog*, for example, the critical cataloging information for each document was transferred onto 80-column punch cards, using a basic numeric coding, such as 01 = A, 02 = B. Different corporate sources for the reports, such as Messerschmidt Plant Number 9, would simply be assigned a unique two- or three-digit code, but the title of each report had to be spelled out completely. Since each card only had space for 10 letters of a title, a single document could require numerous cards. If the document had numerous subject headings, extra cards would have to be used. As a result, a single document might require from 4 to 200 cards. Furthermore, the tabulating machines could report only the information entered on the cards. All bibliographic searches had to be done by hand.[36]

In 1958, ASTIA relocated to this building at Arlington Hall Station.

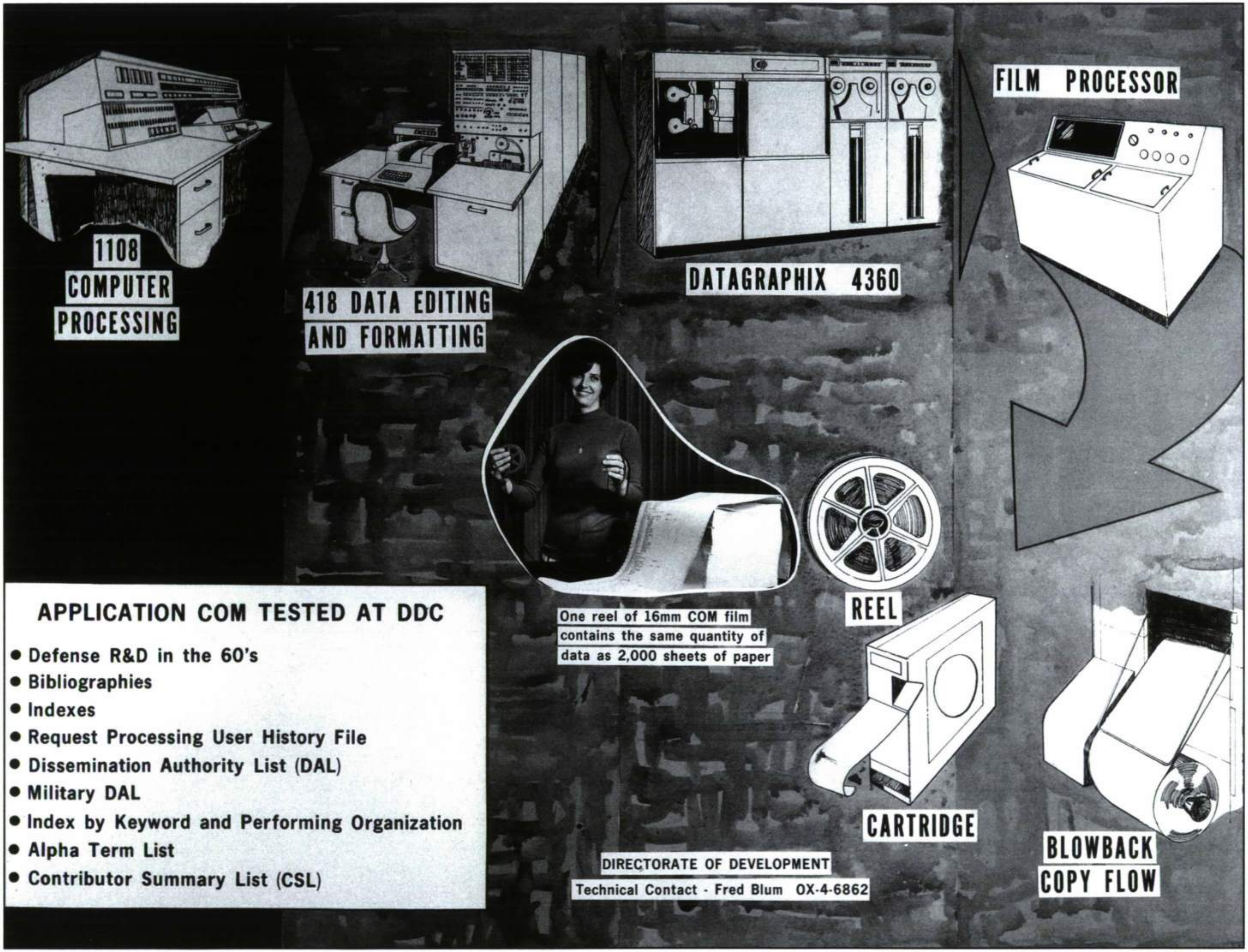
During the early 1950s, ASTIA also began using punch-tape addressographs, to reduce the time required to prepare address labels and elevator files, to increase the speed of searches for duplicate titles.[37] ASTIA also began indexing its documents in March 1953, to prepare the collection for anticipated advances in automation. Documents received into the collection after this time were given ASTIA document (or AD) numbers and indexed under a number of different one-word descriptors, called Uniterms. The idea was that single-word indexing terms could be assigned number codes that a machine would be able to read. By combining several different one-word terms (or number codes), a search could be narrowed quickly to the specific content area covered by a small number of documents in the collection.[38]

The initial groundwork for automation had been laid, but by 1957, the use of machines had been introduced on only a limited, piecemeal basis. What was needed, the management survey concluded, was a comprehensive analysis of how ASTIA's entire operation could best be automated. Several commercial companies were already producing computing machines. But in order to develop a system that would meet ASTIA's particular database and documentation needs, a company would need a blueprint of the kind of system ASTIA required. A systems analysis could provide that kind of information.[39]

ASTIA Embraces Leading-edge Technology

The move to Arlington Hall Station forced work on automation to be put aside until the new headquarters was established. But one month after ASTIA opened its new offices, IBM offered to conduct the kind of systems analysis for ASTIA that the management survey had suggested. IBM determined the aspects of ASTIA's operations that were costing the most in terms of manpower, time, and material and which could best be improved through automation; these were business-type functions, such as request validation, inventory control, and accountability checks on classified documents. Several bibliographic control tasks were listed as good candidates for automation, as well, including index preparation for the *TAB*, duplication check for incoming documents, and reference and bibliographic searches both with and without an AD catalog number.

To create an automatic system geared toward performing these functions, IBM recommended a general-purpose, magnetic-tape, data-processing system. IBM's 650 RAMAC system fit this specification, but so did several other systems being developed by other manufacturers, including the Remington Rand Solid State 90. ASTIA reviewed the various products available and on May 18, 1959, awarded a contract to Remington Rand for its 90-Column Solid-State Computer. In an effort to simply keep up with an overwhelming growth in demand for services, ASTIA found itself on the cutting edge of a new kind of technology that would revolutionize the world. ASTIA was about to become a pioneer on a brand new frontier—the computer age.[40]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COMPUTER
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One reel of 16mm COM film contains the same quantity of data as 2,000 sheets of paper
REEL
CARTRIDGE
BLOWBACK
COPY FLOW
APPLICATION COM TESTED AT DDC
• Defense R&D in the 60's
• Bibliographies
• Indexes
• Request Processing User History File
• Dissemination Authority List (DAL)
• Military DAL
• Index by Keyword and Performing Organization
• Alpha Term List
• Contributor Summary List (CSL)
DIRECTORATE OF DEVELOPMENT
Technical Contact - Fred Blum OX-4-6862

CHAPTER TWO

YEARS OF CHANGE

In 1960, America was entering an era of great technological focus and change. The space race was just beginning, and air travel was being transformed by new, jet-powered airliners built by the Boeing Commercial Airplane Company and its competitor, Douglas Aircraft. The Lockheed Corporation was developing a new reconnaissance spy plane that would fly more than three times the speed of sound. At the same time, industry was beginning to adapt to a new age of automation and computerization that would soon revolutionize how information was gathered, stored, and communicated.

Futurists painted rosy pictures about how computers would improve not only communication but also transportation, housework, and every other aspect of American life. The early computers, however, were a far cry from any of the idealistic images. The computers initially purchased by ASTIA, for example, were two Remington Rand Solid State 90 machines that became operational on February 15, 1960. Aside from the fact that they took up a tremendous amount of space, their capabilities were extremely limited.

For the first 6 months, the computers relied entirely on 80-column punch cards for all data input and output, and processing a document request took three separate computer runs. Each request was compared against the file of cards coded with the security clearance, need to know, and authorization of all ASTIA's customers. Next, this information was compared against cards coded with information on the entire technical report collection to determine if the particular report(s) requested could be released to that person or company. If the request checked out, the computer generated the appropriate inventory, reproduction, shipping, and tracking notices. If it did not, a rejection notice was issued. It was faster than completing these administrative tasks by hand, but it was a time-consuming and cumbersome process. In addition, all bibliographic searches still had to be done manually.[41]

Six months later, the system was modified to incorporate the use of magnetic tapes, which speeded up the process somewhat. Now the system required only two computer runs to process requests and allowed ASTIA to conduct some very basic search techniques. To conduct bibliographic searches on the computer, however, changes had to be

This chart illustrates the computer output microfilm process and the resulting products.

Col. James O. Vann, USAF
DTIC Administrator
1961-1963

made to the terms used to index and describe the documents in the ASTIA collection. Until the advent of computers, two main tools had been used by ASTIA for indexing technical reports. One was the subject-heading guide, which used headings, subheadings, and cross-references to index reports, and the second was the Uniterm system, which used individual descriptive words that could be grouped in various combinations to define and index a document's content.

Thesaurus Streamlines Database Searches

In a manual system, these methods were adequate, if not ideal, but neither was appropriate for a computerized search process. The concepts of cross-referencing and subdivision of terms were too complex, and both the Uniterm and subject-heading lists were too big to be managed by computer. In 1959, for example, the list of subject headings included over 70,000 entries. The Uniterms had been assigned somewhat haphazardly to documents, without any real consistency or centralized list of terms.[42] To solve this problem, ASTIA initiated Project MARS (MAchine Retrieval System) to create a workable vocabulary and indexing system for a computer-based bibliographic search process. A committee within the Document Processing Division of ASTIA undertook the project and reduced the 70,000 subject headings and subheadings to a list of approximately 7,000 descriptors, which were single or multiple word combinations that could be assigned a simple numeric code for computer input and search. Numerous descriptors could be included or combined in a search to narrow the number of citations in the final bibliography. In order for people to use the system, however, they needed a list of the descriptors in some order that would allow them to easily find the appropriate terms for the area or report they needed. The result was the *Thesaurus of ASTIA Descriptors*, which was first published in May 1960.[43]

The Solid State 90s could match descriptors from a request with those listed for each report, but the computers still could not generate a bibliography directly. Instead, they generated a list of ASTIA document (AD)

The ASTIA Thesaurus Development Group undertook a project to develop descriptors for computer input and searches.

The staff of ASTIA's Computer Programming Section works on the agency's first efforts to automate manual tasks.

This Remington Rand Solid State 90 computer became operational in 1960.

numbers corresponding to reports that contained the descriptors in the search. ASTIA employees then had to take that list and retrieve the corresponding catalog cards, which were copied and sent to requesters.[44] It was not until the Solid State 90s were replaced by UNIVAC 1107 model computers in December 1963 that complete bibliographic citations could be printed directly from the computer. The UNIVAC 1107s also had random access capability, which greatly increased their ability to conduct database searches.

The Defense Documentation Center and Its Move to Cameron Station

In the meantime, other changes were taking place at ASTIA. When the Russians launched *Sputnik* in 1957, it sent a shock wave through the American political and scientific communities. It appeared that the Russians had taken the lead in space technology at a time when the U.S. had considered itself to be the technological leader of the world. The concern generated by *Sputnik* intensified over the next few years as the Cold War began to escalate. The American U-2 pilot, Gary Powers, was shot down over Russia in 1960, the Berlin wall was erected in 1961, and in 1962, the Cuban missile crisis brought U.S.-Soviet tensions to a critical point. As a result, any technological advancement by Russia was seen as potentially threatening, and there was a much greater interest among politicians in how the U.S. was managing and furthering its own scientific and technical research and information dissemination.

Starting in 1958, there were a series of hearings in the Senate and House of Representatives, as well as a number of Executive Branch panel investigations and reports on improving the coordination and availability of scientific and technical information in the U.S.[45] Parts of the problem were the size and number of federally funded R&D projects in the country. A 1962 task force report pointed out that in 1940, the federal budget for R&D activities was $100 million. By 1962, that number had increased more than a hundred fold—to an estimated $12 billion.[46] With that kind of exponential growth, problems in communicating, coordinating, and processing of information were bound to occur. But with a higher level of

Indexers consult the *Thesaurus of ASTIA Descriptors*, first published in 1960.

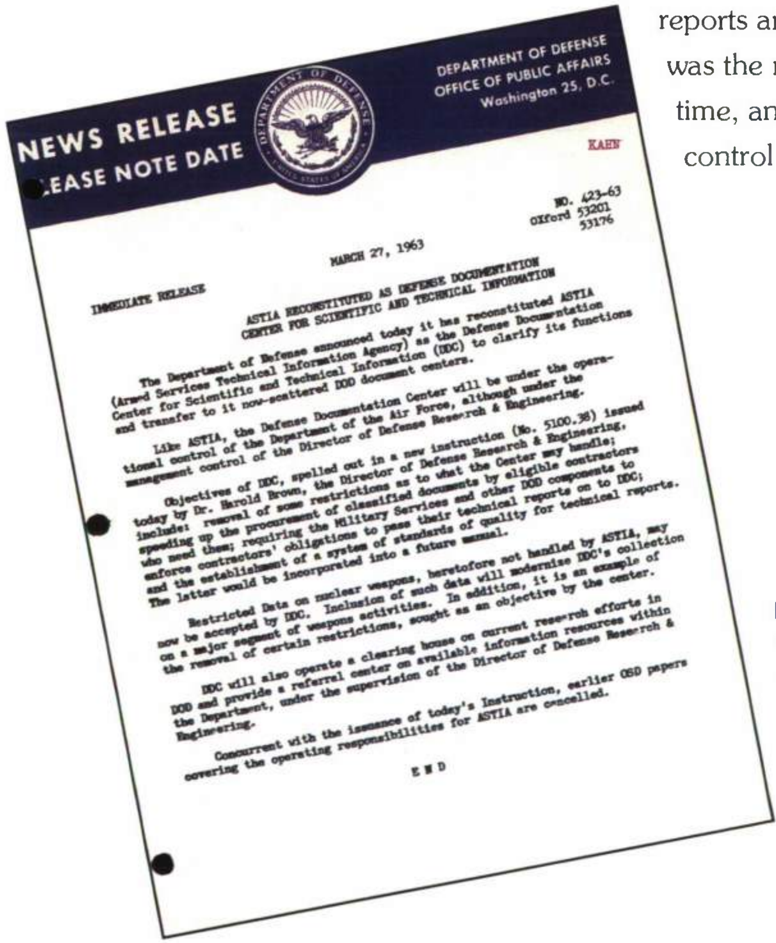
concern about world events and, therefore, the handling of U.S. R&D and scientific and technical information (or STINFO, as it became formally known), there was increased pressure to work on solving these problems.

One result of these studies and hearings, for example, was that agencies concerned with STINFO were given higher status and attention. When ASTIA was created in 1951, the idea had been to provide a centralized repository for defense-related scientific and technical information. Although ASTIA was under the management control of the Air Force, its official policy direction had always come from the DoD R&D Board. With the increased pressure on coordinating scientific and technical research activities, however, the decision was made to move ASTIA to a more central position within the DoD management structure. In March 1963, the management of ASTIA was shifted from the Air Force to a DoD-level office, and its mission was expanded to include development of a formal DoD STINFO program. At the same time, ASTIA's name was changed to reflect its broader mission. On March 19, 1963, the agency became the Defense Documentation Center (DDC) for Scientific and Technical Information.[47]

In addition to moving ASTIA under direct Department of Defense control, DoD recognized that the new DDC needed more physical space than the location at Arlington Hall allowed. Storage and office space in the Washington, D.C., area was still hard to find, but the Army had an empty building at its Cameron Station facility, in Alexandria, Virginia. The building, once the Station's Quartermaster's office, needed extensive renovation but was large enough to hold the DDC collection and activities. On July 8, 1963, Cameron Station became the Center's new home.[48]

The operation was housed in Building 5 at Cameron Station from 1963 until 1995—from 1963 until 1979 as the Defense Document Center and from 1979 until 1995 as the Defense Technical Information Center.

The Pentagon had decreed that the new DDC would be under some kind of DoD-level management. The Defense Supply Agency (DSA), which became the Defense Logistics Agency (DLA) in 1976, was a DoD-level agency that served the common needs of the Department of Defense; it was also located at Cameron Station. Since the DSA and DDC were located at the same facility and since information was, at least in one sense, a commodity to be supplied to the DoD, the DSA seemed the best agency to task with managing DDC. In November 1963, DDC was put under DSA control, and Dr. Robert B. Stegmaier, Jr., who had been the staff assistant to the DoD Director of Technical Information, became the new DDC administrator. The Defense Supply Agency was perhaps not the perfect organizational choice for a center that managed technical reports and scientific information, but it was the most logical choice at the time, and DDC remained under its control for almost 30 years.


NEWS RELEASE
PLEASE NOTE DATE

DEPARTMENT OF DEFENSE
OFFICE OF PUBLIC AFFAIRS
Washington 25, D.C.

KAHN

NO. 423-63
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MARCH 27, 1963

IMMEDIATE RELEASE

ASTIA RECONSTITUTED AS DEFENSE DOCUMENTATION
CENTER FOR SCIENTIFIC AND TECHNICAL INFORMATION

The Department of Defense announced today it has reconstituted ASTIA (Armed Services Technical Information Agency) as the Defense Documentation Center for Scientific and Technical Information (DDC) to clarify its functions and transfer to it now-scattered DOD document centers.

Like ASTIA, the Defense Documentation Center will be under the operational control of the Department of the Air Force, although under the management control of the Director of Defense Research & Engineering.

Objectives of DDC, spelled out in a new instruction (No. 5100.38) issued today by Dr. Harold Brown, the Director of Defense Research & Engineering, include: removal of some restrictions as to what the Center may handle; speeding up the procurement of classified documents by eligible contractors who need them; requiring the Military Services and other DOD components to enforce contractors' obligations to pass their technical reports on to DDC; and the establishment of a system of standards of quality for technical reports. The latter would be incorporated into a future manual.

Restricted Data on nuclear weapons, heretofore not handled by ASTIA, may now be accepted by DDC. Inclusion of such data will modernize DDC's collection on a major segment of weapons activities. In addition, it is an example of the removal of certain restrictions, sought as an objective by the center.

DDC will also operate a clearing house on current research efforts in DOD and provide a referral center on available information resources within the Department, under the supervision of the Director of Defense Research & Engineering.

Concurrent with the issuance of today's Instruction, earlier OSD papers covering the operating responsibilities for ASTIA are cancelled.

E N D

News release issued by DoD Office of Public Affairs announces the name change from ASTIA to DDC.


Robert B. Stegmaier, Jr.
DTIC Administrator
1963-1973

COSATI Standardizes Cataloging

Clerks file microfiche cards into large storage units.

The increased emphasis on scientific and technical research in the early 1960s put additional pressure on ASTIA/DDC to computerize its operations and improve its service and response times. In addition, the various studies and hearings had recommended that more effort be put into coordinating STINFO activities among federal agencies. An influential 1962 Presidential Task Force report on scientific and technical communication in government recommended the formation of a standing committee within the President's Office of Science and Technology to help facilitate this process. This committee, formed under the Federal Council for Science and Technology, became known as the Committee on Scientific and Technical Information (COSATI).[49]

COSATI consisted of representatives from the DoD, the National Aeronautics and Space Administration, the Atomic Energy Commission, the Department of Agriculture, the Department of Commerce, and the Department of Health, Education, and Welfare. COSATI's mission was to improve and standardize the way scientific and technical information was handled by government agencies, so it could be shared more easily and effectively. The placement of the committee within the President's Office of Science and Technology emphasized the high-priority status of the project.

One of the first tasks facing COSATI was to standardize the way technical documents were categorized and cataloged within the different agencies. In December 1964, the Committee issued its first official *Subject Category List*, which became the standard for categorizing technical documents for need-to-know purposes. The COSATI system consisted of 22 major subject "fields," with 178 smaller "groups" and "subgroups" that could be assigned to documents. Within DDC, the COSATI *Subject Category List* replaced the SAIS divisions and sections that had been in use since 1947.[50] Eventually the COSATI group developed standards for many common media and functions, including microform format, thesaurus development, and machinable descriptive record format.

During this same time period, DDC was also working to improve and expand the services it could offer to its own customers. By 1964, microfiche cards had replaced microfilm as the primary storage medium for documents. The microfiche were easier to mail and store, and they speeded up access to particular pages within documents.

The process of creating bibliographies by computer was improving, as well, and by 1966, the UNIVAC 1107 computers were reliable and capable enough that DDC discontinued the manual creation of catalog cards. All bibliographic records and searches from that point forward were managed by the computerized system. In addition, DDC began offering a rapid-response service that allowed users to request a bibliographic search by Telex machine. DDC's response listed only the AD numbers of relevant documents, much like the earliest computerized bibliographic searches, but the search results could be sent back to the customer by Telex within 24 hours.

Developments in DDC User Service

DDC was also expanding the kind of information it could provide to users. In 1964, DDC began providing a referral service for DoD STINFO. The referral service did not allow users to order documents from other collections through DDC, but it directed users to the specific agencies, analysis centers, or databases where they could find additional reports or information. Then in 1965, DDC began managing a second database, called the Work Unit Information System (WUIS). The database stemmed from a DoD system for managing ongoing R&D efforts called the Research, Development, Test and Evaluation (RDT&E) Project Card Program. The project cards were mandatory progress reports that any company or laboratory conducting DoD-funded research were required to submit on a regular basis. Many of the projects were broad in scope, however, and information on individual areas (or work units) within the projects was sometimes hard to locate. The WUIS, compiled on DDC's computers, was developed to improve the access to this specific information. Under the WUIS program, information on progress within each work unit of all DoD-sponsored research projects was submitted to DDC at least once a year. The updates were submitted and entered into the computer as single, one-page reports, so they were easy to scan for relevant information.

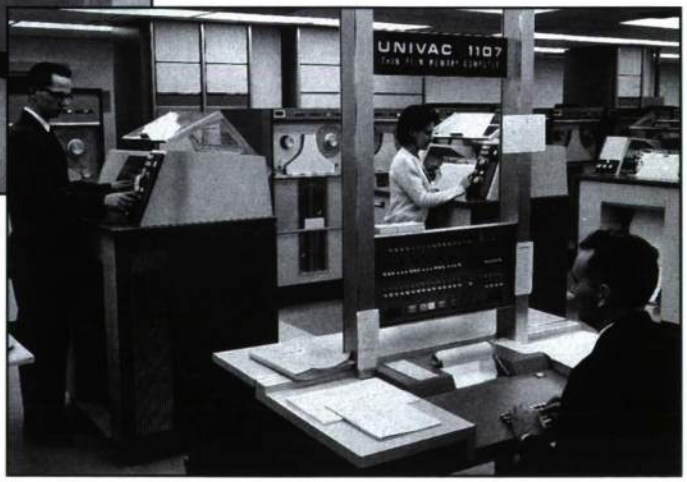
Initially, the WUIS database was envisioned solely as a DoD management tool, and access to the information was restricted

Machines such as the Filmac 100 transferred microfiche onto paper copy.

to DoD personnel. Even in this limited function, the database gave R&D managers within the Pentagon better access to information for decision-making purposes than the Project Card Program had provided.[51] But soon after the database was compiled, other users and contractors began asking for access to the information, as well. It was, they argued, the best way for them to get up-to-date information on the people and organizations conducting similar or relevant research to their own projects. Access to the WUIS database would help them gather and share information at the time when it could be most useful—while the research was still in progress.

This argument had merit, so the WUIS database was slowly opened up to contractors and researchers outside of DoD. Initially, only part of the WUIS reports were approved for release to outside agencies and personnel, but eventually the entire database became available not only to approved contractors and researchers but to government officials, as well. Members of Congress, for example, could find out what research was going on in their districts. Within a few years, the WUIS program had evolved from a project management tool into an information source as valuable as DDC's technical report database.

Magnetic tape drives and card readers were standard in the computer room of the 1960s.



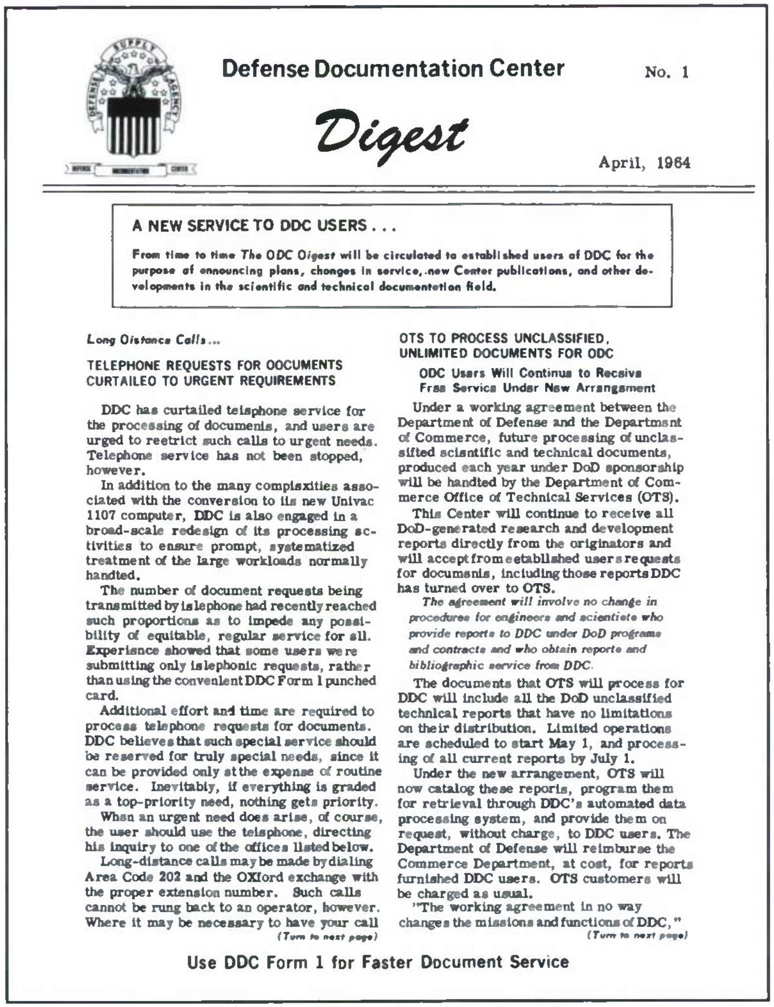
Operators print out complete bibliographic records from the UNIVAC 1107 model computer.

In 1966, DDC began offering its database information to users in a new format. Some of the larger contractors and laboratories now had their own computer systems that were capable of reading magnetic tape. So DDC began providing magnetic computer tapes to approved users who wanted to be able to conduct their own bibliographic searches. The reports were still kept at DDC headquarters, and the tapes were tailored so that they contained only the information the user was cleared to receive. But the magnetic-tape exchange program gave researchers with large, on-site technical libraries the ability to conduct computerized searches of their own instead of having to page through the printed *TAB* for relevant reports or ask a DDC staff person to conduct a search for them.[52]

Establishment of User Fees

Another change in DDC services took place in the late 1960s when it began charging a nominal fee for the reports it provided. In 1968, a $3-per-document fee was imposed for a hard copy of reports when the microfiche copy was available. In 1971, a 95¢-per-document charge was imposed for microform products, as well. The idea was to keep customers from ordering more documents than they really needed or could use and to reduce the workload and expense for DDC.

DDC and DTIC would continue to struggle with the tricky issue of user fees. On the one hand, user fees undoubtedly accomplished the goal of reducing unnecessary ordering, but they also raised a potential obstacle in the sharing and accessing of information. Even the abstracts printed in the *TAB* did not always provide enough detail for a researcher to be able to determine if a report was important to review. Since there was no way a user could preview the actual document before ordering it, the fees imposed on the documents made researchers more hesitant to use DDC's services. It also added another complication in disseminating the information—accounts had to be set up and approved for payment before documents could be sent to users. A 1975 analysis of DDC's services cautioned that "...user charges have effectively lessened the flow of government information to libraries and end users...its effect on Defense R&D is incalculable."[53] In more recent years, DTIC created a pricing review committee to maintain a reasonable balance between fees that discouraged use and fees that merely discouraged overuse. But since the late 1960s, user fees, on some level, remain a fact of life for DTIC users.


Defense Documentation Center

No. 1

Digest

April, 1964

A NEW SERVICE TO DDC USERS . . .

From time to time The DDC Digest will be circulated to established users of DDC for the purpose of announcing plans, changes in service, new Center publications, and other developments in the scientific and technical documentation field.

Long Distance Calls ...

TELEPHONE REQUESTS FOR DOCUMENTS CURTAILED TO URGENT REQUIREMENTS

DDC has curtailed telephone service for the processing of documents, and users are urged to restrict such calls to urgent needs. Telephone service has not been stopped, however.

In addition to the many complexities associated with the conversion to its new Univac 1107 computer, DDC is also engaged in a broad-scale redesign of its processing activities to ensure prompt, systematized treatment of the large workloads normally handled.

The number of document requests being transmitted by telephone had recently reached such proportions as to impede any possibility of equitable, regular service for all. Experience showed that some users were submitting only telephonic requests, rather than using the convenient DDC Form 1 punched card.

Additional effort and time are required to process telephone requests for documents. DDC believes that such special service should be reserved for truly special needs, since it can be provided only at the expense of routine service. Inevitably, if everything is graded as a top-priority need, nothing gets priority.

When an urgent need does arise, of course, the user should use the telephone, directing his inquiry to one of the offices listed below.

Long-distance calls may be made by dialing Area Code 202 and the OXford exchange with the proper extension number. Such calls cannot be rung back to an operator, however. Where it may be necessary to have your call

(Turn to next page)

OTS TO PROCESS UNCLASSIFIED, UNLIMITED DOCUMENTS FOR DDC

DDC Users Will Continue to Receive Free Service Under New Arrangement

Under a working agreement between the Department of Defense and the Department of Commerce, future processing of unclassified scientific and technical documents, produced each year under DoD sponsorship will be handled by the Department of Commerce Office of Technical Services (OTS).

This Center will continue to receive all DoD-generated research and development reports directly from the originators and will accept from established users requests for documents, including those reports DDC has turned over to OTS.

The agreement will involve no change in procedures for engineers and scientists who provide reports to DDC under DoD programs and contracts and who obtain reports and bibliographic service from DDC.

The documents that OTS will process for DDC will include all the DoD unclassified technical reports that have no limitations on their distribution. Limited operations are scheduled to start May 1, and processing of all current reports by July 1.

Under the new arrangement, OTS will now catalog these reports, program them for retrieval through DDC's automated data processing system, and provide them on request, without charge, to DDC users. The Department of Defense will reimburse the Commerce Department, at cost, for reports furnished DDC users. OTS customers will be charged as usual.

"The working agreement in no way changes the missions and functions of DDC,"

(Turn to next page)

Use DDC Form 1 for Faster Document Service

The first issue of the *DDC Digest* was published in 1964.

The *DDC Digest*

To keep users abreast of the changes and new service developments at DDC, the Center began printing a new publication, called the *DDC Digest*.[54] Distributed to all registered users four times a year, it contained tips on how to access and use DDC services more efficiently and updated new procedures, rules, and services.

Opening of Regional Offices

While DDC was expanding its services through the *DDC Digest*, rapid response bibliographies, the magnetic tape distribution program, and the development of the WUIS database, at least one user service was being curtailed. Starting in 1950, CADO/ASTIA began opening regional offices around the country to allow users more direct access to its resource materials. A Los Angeles office was established in December 1950, followed by a New York City office in November 1952, and a San Francisco facility in 1957. Regional offices also existed in Dayton, Ohio; Boston, Massachusetts; Washington, D.C.; and Huntsville, Alabama.

Yet by 1966, the regional offices were beginning to be seen as a potential security liability, as well as an unjustified expense. Maintaining secure procedures for classified information was more difficult in the regional offices where staffing was minimal, and the offices were not being used enough to make the expense of operating the facilities worthwhile. Furthermore, as computer operations improved the turnaround time for bibliography and report requests, DDC managers became more confident that adequate services could be provided to users directly from DDC headquarters. All the regional offices except the one in Los Angeles were closed by December 1966, and the Los Angeles office was closed 5 months later.[55]

Search Problems and the Birth of DROLS

In reality, however, the services provided by DDC were still not as prompt as its users required. Even with the help of computers, bibliographic searches took anywhere from 6 to 30 days to obtain. The initial request had to be either called or mailed in to DDC. A retrieval analyst reviewed the request and developed a search strategy to locate the relevant information. The search then was converted into a machine-readable format, batched with other bibliographic requests, and run through the computer. The resulting bibliography was sent back to the analyst, who reviewed it to see if the results matched what the user had requested. If the analyst thought they did, the results were mailed to the user. If the results were unsatisfactory, the analyst ran additional search strategies until an acceptable product was received. Each search took 6 days for the analyst to process, so it could be 3 or 4 weeks until the requester received the results if more than one search had to be run. Even then, the results might not be exactly what the user wanted, in which case the process had to be repeated over again. It was in response to this kind of delay and frustration that DDC developed the system that not only significantly improved its search capabilities, but also "put (the Center) on the map."[56] That system was the DDC Remote Online Retrieval System, which evolved into the Defense RDT&E Online System (DROLS) in 1974.

Defense RDT&E Online System

The DROLS concept gave users direct, online access to the DDC databases so they could conduct their own bibliographic searches. The searches would be conducted in real time, and a user could change the strategy or rerun the search as many times as necessary, thereby eliminating the middle person at DDC and improving the quality and utility of the search results.[57]

The online system became possible as a result of improvements in DDC's computer capabilities over the course of the 1960s. In 1966, DDC developed the ability to input information and commands directly from a computer terminal instead of through punched paper tape into an IBM 1440 computer specifically designed for the task. And in January 1968, the Office of the Secretary of Defense (OSD) gave DDC approval to acquire a new and much more capable UNIVAC 1108 computer to replace the earlier 1107 model. The UNIVAC 1108 computer could be accessed directly through a computer terminal for both input and retrieval applications and had the speed and capacity to make a remote, online system feasible.

Experiments with the first prototype online retrieval terminal actually began at DDC before the 1108 computer was purchased. The original concept of DROLS was as a tool to improve DoD management of current research projects, so the initial work was conducted with the WUIS database. The prototype terminal, linked to the 1107 computer, was installed at DDC in 1968. By June 1969, DDC had upgraded to the UNIVAC 1108, and in addition to the original terminals at DDC, a remote terminal was set up at the Air Force Supply Center. It quickly became apparent that an online retrieval terminal could be extremely useful in accessing technical data as well as management information, so 6 months later, the system was expanded to include the DDC technical report database.[58]

The DDC Remote Online Retrieval System was not the first online system to be developed, but it was cutting-edge technology and unique in several ways. Probably the major distinguishing feature of the system

Christine Partch works at the DDC Univac 1108 computer-processing console.

and the one that created the biggest design headache was the fact that the system had to be able to handle both classified and unclassified information. The system had to identify the security classification and need-to-know approval of different users and allow each company, laboratory, or person to access only the type of information they were cleared to receive.

Remote Terminals

The remote terminals for the system were connected to DDC's mainframe computer through dedicated, secure phone lines with encrypting devices at both ends. The hardware was not that unusual, but the software to create a secure system had to be custom-designed. Not surprisingly, therefore, the major source of the early technical difficulties encountered with the system was the software, both at DDC and at the remote sites. In a 4-month test of the first three in-house DDC terminals and four remote sites in 1970, for example, there were no fewer than 200 computer stops.[59] To combat the unreliability of the system, people working with the Navy's first remote DDC terminal in San Diego learned to batch all their search requests together and put them on a single tape. That way, when the system was "up," they could run the requests and get responses quickly before it "crashed" again.[60]

Nelson Montague searches DROLS at one of the first remote terminals, the Uniscope 100.

The system could be frustrating, and it was not as reliable or as user-friendly as other online systems of that time that did not have to worry about handling both classified and unclassified material. Also, this was an expensive system for a site to install. In 1972, the cost for each dedicated, secure terminal was estimated at $26,570 to install, with a recurring yearly cost of $17,532. Nevertheless, it accomplished its mission. Bibliographic searches could now be accomplished in minutes instead of weeks. By 1972, the system was fully operational, with 15 remote terminal sites. Two years later, the DDC Remote Online Retrieval System was redesigned into the operational system known as DROLS.

Growth of DROLS

Over the next few years, interest in DROLS continued to grow. The initial system was designed for 28 terminals, and after a short period of time, DDC requested additional funds to expand the system to 128 terminals. Some people were skeptical that DDC would ever have 128 sites that would want to use the system. But over the next 15 years, DDC not only found 128 interested customers but went on to connect more than 1,000 remote terminals to the system. The system was also improved to include unclassified, dial-up access; this was in addition to dedicated terminals and, eventually, classified dial-up service. To this day, DROLS remains the only large-scale, secure, online database input and retrieval system in existence.[61]

ASTIA had been at the forefront of computerized database storage and retrieval system technology in 1960. A decade later, DDC was once again blazing new trails in information technology by creating a secure, online information system. In neither case had the agency set out expressly to push the state of the art in information systems. It was simply that the task assigned to ASTIA/DDC was so overwhelming and was becoming more difficult as the volume and complexity of information increased that the agency had to look to new technology to handle the job it was assigned to do.

DROLS also, for the first time, opened up the possibility of end users directly accessing the information at DDC. This change did not actually occur at the time, as DROLS was not considered user-friendly. Most companies that installed DROLS terminals also assigned designated personnel to operate the system for the engineers and researchers who needed the information. But DROLS was the first step into technology that would eventually change the composition of DDC's user community.[62]

But even if the end users were not yet accessing DDC information directly, they were beginning to influence the way DDC provided that information. In an effort to solve problems in working with DROLS, for example, informal user groups began to be formed around the remote terminal sites. These groups helped create networks for channeling information to and from DDC, solve operational problems with the terminal, and provide training for new DROLS users. They also provided a more unified voice to influence changes and improvements in the DROLS product. By 1971, there were 45 user groups, and 21 more were in the process of being formed.[63]

Establishment of Satellite Offices

By the early 1970s, the Los Angeles users of DROLS and DDC services had become unhappy with the service they could receive from DDC headquarters. Because of the time-zone difference, there were only a few hours a day when they could reach someone at headquarters, and not all of the contractors and laboratories had their own DROLS terminals. A regional office, the users argued, could offer faster service, access to DROLS for those companies without their own dedicated terminals, and more convenient hours of operation. Researchers in the technology centers around Boston also wanted a local office reopened. DDC listened to the complaints, and as a result of the user community pressure, DDC reinstituted two of its field offices. The Los Angeles office was reopened in 1975. For the first year, the office was an unclassified facility, but it was upgraded to provide classified services in 1976. A second regional office was opened in Boston in 1976.[64]

New Programs Developed

The changing needs of users and the ever-increasing amount of information that was beginning to swamp researchers and managers also led to the development of other new DDC products in the 1970s. In 1970, DDC began offering a Current Awareness Bibliography (CAB) program, which matched a user's interest profile with new reports received into the DDC collection. A bibliography of all the new reports that fit the user's area of interest (and were appropriate for that user to receive) was compiled and automatically sent to the user twice a month. This saved the user from having to regularly search all the listings in the *Technical Abstract Bulletin* or conduct individual bibliographic searches to stay up to date with new advancements.

A similar product was the Automatic Document Distribution (ADD) program, which sent out copies of the actual technical reports. Subscribers to the ADD program, which became operational in 1971, received new reports every two weeks. An equivalent service for the WUIS database, called the Recurring Reports program, also began in 1971.[65]

All of these products were designed to help end users find their way through an overload of information, which was increasing exponentially. Without new tools that could help whittle down the mountain of reports and information that was being produced in the scientific and technical community, researchers might revert to ignoring other work simply because they lacked the time to locate the relevant pieces of information.

The Albuquerque Regional Office.

The Boston Regional Office, located at Hanscom AFB, was opened in 1976.

DROLS Expansion

DROLS was expanding, as well. An unclassified version of DROLS was instituted in 1973 so users without security clearances could access unclassified citations directly. Two more databases were also added to the system in the mid-1970s. In 1975, an Independent Research and Development (IR&D) database was incorporated into the system for research relevant to but not funded by DoD. This database was limited to DoD personnel because it was proprietary, and submission of the information was voluntary. There was an incentive for contractors to submit information, however, because if DoD was interested in the research that contractors were conducting independently, the reports could lead to future DoD-funded contracts.[66]

The fourth database, which was active until 1982,[67] was the R&D Program Planning (PP) database. It consisted of information submitted by the different branches of the military on projects that were being considered for funding. This database, available to DoD managers only, was designed to reduce duplication of effort and to help give DoD managers a clear vision of what was being planned and funded and what was still needed.[68] With these four databases, DDC could, in theory, provide information on all aspects of defense-related research, from planned work to current, completed, and future projects, as well as industry-funded research.

DDC's products were expanding because the information needs and expectations of its customers were growing at such a rapid pace. As the information age progressed and advances in technology made it possible to access more material, information became recognized as more than just a resource. It was a lever of power. And in a world where information was prolific and changing quickly, simply storing and disseminating technical reports was no longer a sufficient endpoint. The endpoint was becoming the information that would provide power for decision-makers and researchers involved in Defense RDT&E. That information might be in a technical report, but it also might be in a WUIS summary, the Independent Research and Development (IR&D) database, or the Program Planning records. It might be scientific in nature, but it also might be information relating to budgetary requirements, other DoD activities, or long-range DoD R&D plans.

DDC was evolving again. In 1963, management of the Center had been elevated to a DoD level to emphasize the importance of its mission, but it was still—as its name indicated—a documentation center. By 1979, its customers needed more than documents. They needed specific, relevant, and timely information of various types from a growing number of sources, including foreign and intelligence-derived. Documentation and dissemination of technical reports was no longer the end goal for DDC. It was simply one means for getting DoD officials and researchers in the field the information they needed.

DDC Becomes DTIC

In recognition of the expanded role DDC was beginning to play as an information resource, the Center's name was changed once again. In October 1979, with a directive from Dr. Ruth M. Davis, the Deputy Under Secretary of Defense for Research and Engineering, to "work more closely with R&D managers in the Pentagon and provide them with technical and management information," the Defense Documentation Center became the Defense Technical Information Center.[69]

Main gate and duck pond at Cameron Station, where DTIC's office was located from 1963 until 1995.

James E. Adkins and Al Miller display the sign in front of Building 5, Cameron Station. In 1979 the Center was renamed to reflect an upgrading of the role and functions of DTIC.

CHAPTER THREE

NETWORKS, PERSONAL COMPUTERS, AND CUSTOMIZED INFORMATION

When the Defense Documentation Center (DDC) was renamed the Defense Technical Information Center (DTIC) in 1979, it signaled a new era, not only for the Center but in the information age, as well. The technology was still a few years off, but computer industry analysts realized that a new generation of computers was going to change the way people could process and use information as radically as the first computers had 20 years earlier. Between the years 1979 and 1989, dramatic advances were made in computing power and capabilities. In 1979, an IBM 370/138 computer with 1 megabyte of main memory took up the better part of a room and cost $328,680. Ten years later, an IBM personal computer (PC) with 1 megabyte of main memory could fit on a desktop and cost around $3,000.[70]

The advent of PCs meant that end users of information could access and interact with sources directly and then process the results themselves. This capability allowed them to become more active—and subsequently more demanding—users of any computerized database system. Customized information was growing in demand, partly because technology was making it possible and partly because that same technology was making it necessary. As John Naisbitt observed in his 1982 book *Megatrends*,

> *...with the coming of the information society, we have for the first time an economy based on a key resource that is not only renewable but self-generating.... Running out of it is not a problem, but drowning in it is.*[71]

Coping with the Information Explosion

DTIC, like many organizations, found itself struggling to keep up with the lightning

Scenes from an Annual Users Conference where users and the DTIC staff meet to exchange ideas and share information.

Claudine Long (center) and Loretta Brown (right) demonstrate the Corporate Source Authority System to Barbara Lesser (left).

pace of information technology and the growing expectations and needs of its customers. Researchers and managers wanted more of the information that was becoming available, and they needed help in processing it so they did not drown in a data overload. DTIC's challenge was greater than most, however, because its efforts to expand the products, tools, and information available to its users were complicated by the need for maintaining security over that information.

The users complained, for example, that the databases in the Defense RDT&E Online System (DROLS) were difficult to search, and the system did not have the capabilities of the commercial networks available at the same time. One of the reasons DROLS was so difficult to use was that it was created in the early, almost primitive days of online systems. Its COBOL programming software was becoming archaic even by 1980. But none of the more easily accessible or capable commercial systems could protect classified information or handle both unclassified and classified information.

The classified component of DROLS also increased the cost of the system. The cost of the technology had decreased dramatically since the first DROLS terminals were installed, but in 1980, the one-time cost of installing a classified terminal was still about $11,000, with an ongoing monthly cost of $1,000. An unclassified terminal, by comparison, cost only $100 to install and approximately $150 a month to operate. Since only 7% of the citations in the DROLS Technical Report database were classified, DTIC managers thought that perhaps DROLS should be turned into an unclassified service. If it didn't have to protect classified information, DROLS could offer more of the services provided by commercial databases and at a significantly lower price than the existing system.[72]

In 1980, DTIC asked the Institute for Defense Analyses (IDA) to conduct a study to see whether this change would be feasible and/or acceptable for DTIC's users. What the IDA researchers found, however, surprised them. The users who currently had classified terminals indicated that they would "object strenuously" to a purely unclassified system. The fact that the number of documents affected by such a change would be small and they could still access bibliographies or copies of classified reports by telephone and mail services did not matter. These customers considered the cost of a classified terminal low compared to the value of timely access to classified information when it was needed. They also argued that time lag involved with mail or telephone services could jeopardize their ability to meet deadlines on critical projects. As a result of this feedback, the IDA report concluded that even though it seemed to make more sense to declassify the system, the two-tiered DROLS service should be continued, at least for the present.[73]

The report's conclusions did not mollify all the DROLS customers who had classified terminals, however. That DTIC would even suggest declassifying DROLS indicated to some of the customers that the Center did not understand their needs and priorities. The concern was not totally unjustified. In fact, it was a problem DTIC had been struggling with for several years. In 1976, a report commissioned by what was then DDC to assess its future needs concluded that the Center had to develop a means of determining user needs and problems on a continuing basis. "DDC has had difficulty in getting a focused view of what the user community needs," the report noted, because "the user community is very dispersed, sometimes apathetic, and has no real spokesman."[74]

Establishment of the DTIC User Council

The suggestion that DROLS be turned into an unclassified service, however, energized the classified users of the system. It also spurred the users to create an organization to give DTIC regular feedback on just what their needs and priorities were. The first steps toward organizing a User Council were made at a western regional meeting of DROLS users in 1980, and the organization was formalized at DTIC's annual DROLS Users Conference and Training Seminar in the fall of that year. Finally, DTIC's users had a unified voice. And over the next 15 years, the User Council would prove to be a valuable resource for DTIC as it attempted to match its services with the rapidly changing needs of its user community.[75]

The first User Council included: (front row, left to right) Fred Lewis, Hughes Aircraft; R. Paul Ryan, US Army Ballistic Research Laboratory; Harold Smith, Grumman Aerospace Corporation; Jim Sparks, US Army Research Office; (back row, left to right) Don Erikson, Naval Sea Systems Command; Evelyn Oathout, Civil Engineering Laboratory; Betty Fox, Defense Nuclear Agency; and Margaret Putnam, Air Force Weapons Laboratory.

Helen Viel (left) and Randy Bixby discuss DTIC's development efforts with Jack Jones (standing).

Time Delays Alleviated by New System

Another user's committee that DTIC formed in 1980 was the Resource Sharing Advisory Group (RSAG). The impetus for this second organization was an experimental system DTIC was investigating to allow users to input information directly into the DROLS computer. The system was called the Shared Bibliographic Input Experiment (SBIE),[76] and it was designed to reduce some of the administrative tasks and time delays associated with cataloging and announcing new reports. Users could input cataloging and descriptive information about technical reports directly into the system, and they could also flag reports that were available through that company's or laboratory's own technical library. Different organizations had different cataloging techniques, however, so it quickly became apparent that some kind of coordinating group was necessary to resolve these issues. The RSAG was the committee formed to accomplish this task.[77]

Local Automation Model and the Scientific and Technical Information Library Automation System Simplify Tasks

The differences in cataloging techniques and formats also led to the development of a new technology at DTIC known as the Local Automation Model (LAM). The RSAG could discuss differences and try to develop common cataloging guidelines among users, but it occurred to a number of people at DTIC that there might be a technological solution to this problem, as well. The LAM, designed by DTIC's employees, was a library system that could automatically reformat cataloging entries into a standard DTIC protocol and handle other collection management tasks. DTIC began working on the LAM prototype in 1982 and tested it within its own system for several years. The LAM proved so successful that an outside company eventually developed it as a commercial product. The commercial version of the automated library system, known as the Scientific and Technical Information Library Automation System (STILAS), became available to technical libraries in 1990 and replaced the LAM at DTIC.[78]

The SBIE and LAM projects could help users input information more easily to DTIC's databases. But even more critical to DTIC's users was improving the ways they could obtain important data. As information became a greater lever of power and as more material became available, DTIC's customers needed help in finding, processing, and analyzing a wider range of information from a growing variety of sources. To answer these needs, DTIC would have to expand its scope, either by networking with other agencies and organizations or by adding to its own services. This required a significant change in philosophy and orientation within DTIC, however. Until the 1980s, DTIC required that any document listed in its bibliographic citations had to be physically located in its own collection. But to meet its users' growing needs for information and information analysis, DTIC began reaching out beyond its own boundaries.[79]

The Infrared Information Analysis Center, located in Ann Arbor, Michigan, is one of the IACs placed under the administrative control of DTIC.

Specialized Technology Areas Addressed by the Information Analysis Centers

DTIC was not the only entity trying to help DoD researchers obtain relevant technical information. Soon after World War II, while the predecessor agencies to DTIC were collecting and cataloging technical reports, the three military services realized that this rapidly growing body of information would soon become overwhelming to researchers and managers. In order for these people to stay abreast of state-of-the-art technology, they would need assistance in analyzing and synthesizing the ever-increasing number of reports, studies, and other sources of information.

The solution of the Navy and Air Force (and later the Army) was to form Information Analysis Centers (IACs), which were tasked with acquiring, evaluating, analyzing, and synthesizing information in specialized technology areas. The first Information Analysis Centers were organized in the late 1940s and early 1950s, but the effort received a big push when technology development and information became a higher government priority in the early 1960s. A 1963 report of the President's Science Advisory Committee on Science, Government, and Information (known as the Weinberg Report), for example, listed the Information Analysis Centers as one important means to improve information transfer among government agencies and researchers.[80]

Some of the IACs were operated by DoD directly and others were operated by contractors, but their number continued to grow. In 1960, there were seven DoD-operated IACs. By 1990, that number had grown to 25, reflecting the increasing need by DoD for easily accessible, synthesized, and analyzed information.

In July 1971, nine contractor-operated IACs were put under administrative and budgetary control of the Defense Supply Agency (renamed the Defense Logistics Agency (DLA) in 1975), which also controlled the DDC. By the time the DDC changed its name to DTIC in 1979, it was becoming clear that creating a link with the IACs could allow DTIC's customers to obtain an important supplemental service. So DTIC began to increase the availability of bibliographic information from several of the DLA-managed IACs available to its customers. DTIC was already providing bibliographic services with its DROLS service for three of the IACs, so the initial change was not difficult. The bibliographic information provided to DTIC by the IACs was simply included in bibliographic searches conducted by other appropriate DTIC users, as well. The connection between the two types of resource centers became even stronger, however, when all nine contractor-run IACs were put under the direct administrative control of DTIC 10 months later.[81]

The inclusion of the IACs expanded the kinds of services DTIC could help its customers obtain. As opposed to DTIC, which collected and disseminated documents and report summaries that contained important information, the IACs provided customized and evaluated information directly. The IACs would answer simple phone inquiries for technical information or bibliographic requests for DoD personnel, approved contractors, or agencies without charge, while charging for more complex analyses. Not all researchers wanted or were able to pay for an IAC to analyze data for them, but the service was a valuable one to have available. In fact, a 1990 study of the IACs' value estimated that customers' benefit-to-cost ratio for the IAC services they used averaged 4:1.[82]

Automated Decision-Support System Established

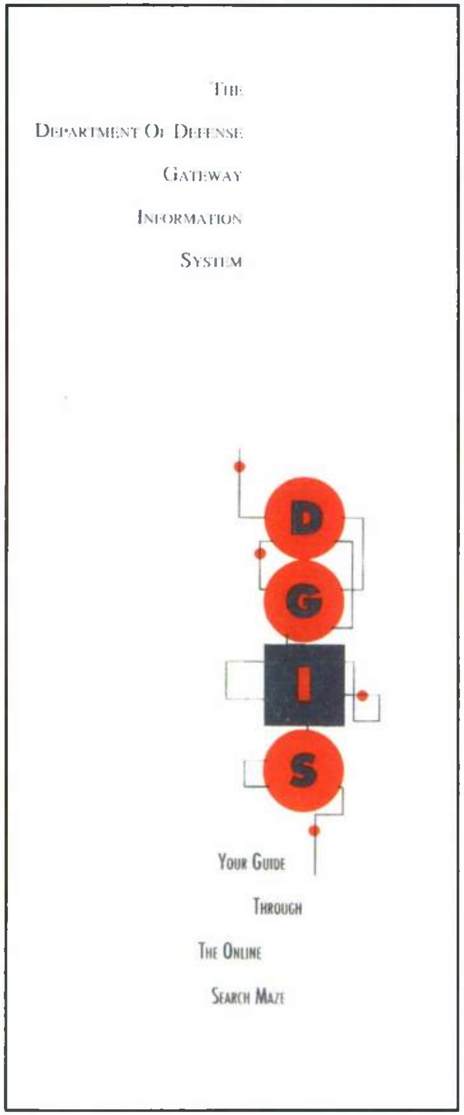
DTIC's connection with the IACs was the first of several linkages that the Center formed during the 1980s in an effort to expand the types and sources of information available to its customers. In 1982, for example, DTIC was asked to take over management of an automated decision-support system, called the Manpower and Training Research Information System

(MATRIS). The Navy had begun development of the database in 1975 to provide information on research and development projects related to manpower, personnel, and training.[83] Although the Navy managed the system, the information came from all the services and consisted of subjects ranging from human factors research to personnel management issues and training guidelines.

Management of the MATRIS program was transferred to DTIC for two reasons. First, the database had been developed as an experimental system, and DTIC was better equipped than its designers to run the service on a long-term basis. Second, although the database was designed as a DoD-wide resource, its location in a Navy research center would undoubtedly discourage its use by personnel in other branches of the military. DoD managers reasoned that if MATRIS was under the management of a centralized agency, people throughout the DoD would be more likely to use it. DTIC was a logical choice for that role because of its proven expertise in managing databases.[84]

The linkages between DTIC and the MATRIS and IAC programs were primarily administrative as opposed to technical, however. Aside from the IAC bibliographic information included in DTIC searches, the DTIC, MATRIS, and IAC databases were separate entities that had to be accessed independently. But as computer networking technology progressed, DTIC began working on a system that would link its customers more easily and directly with not only the IAC and MATRIS databases, but other sources, as well.

MATRIS displays its products and services at an exhibition.



The Department of Defense Gateway Information System (DGIS) brochure.

Department of Defense Gateway Information System Simplifies Access to Hundreds of Databases

DTIC made its first step toward creating a broad kind of computer network in 1980 when it contracted with the TYMNET computer network system to allow users to access long distance dial-up to unclassified information in its DROLS databases. By using a phone modem, users who did not need to access DROLS often could dial into the TYMNET system, which would then connect them with the DROLS computer at DTIC. This freed up the terminal at the customer's office for other uses during the day and reduced the cost of DROLS for infrequent users since the company would only have to pay for that time actually spent online with the DROLS computer.

In 1982, DTIC began working with the Department of Energy, the National Aeronautics and Space Administration (NASA), and the National Technical Information Service (NTIS) on an intelligent "gateway" networking system. While many databases were online by that time, each had to be accessed independently, using its own unique protocol. This was both time-consuming and complicated for users who were trying to search multiple databases for information. The DTIC Gateway was designed to create a network of databases so that users could access all of them through a single access point and protocol.

The Department of Defense Gateway Information System (DGIS) was modeled on the Technical Information System (TIS) under development by the Lawrence Livermore Laboratory, in California. In addition to simplifying access, the system allowed users to download information from any of the databases. It also performed basic post-processing tasks to analyze the information compiled from the databases, which kept users from being overwhelmed with the available data. Research, development, and testing of the DGIS concept continued for 6 years. In 1988, the system became operational, allowing users to obtain information from more than 800 government and commercial databases though a single access point. At first, the network provided only citations to documents in other collections. But eventually, the capability was added to allow users to order actual documents through the system, as well.[85]

The DGIS network could be searched in one of three ways. One option was to use the native command language for each database. A second option was to use a common command language that told the computer what the user wanted through a combination of letters, numbers, slashes, and periods typed onto a single line. This approach was the most common, although not necessarily the most user-friendly method of interacting with a computer at the time. DGIS could also be searched using a third option, a menu-driven interface SearchMAESTRO. The interface, a tailored version of Easynet, was not as fast or as capable as the common command language, but it was easier for less computer-literate people to use.[86]

The fact that DTIC included a user-friendly interface in the DGIS network was a reflection that DTIC's user community was changing. At one time, most of the people conducting searches through DTIC's online services were librarians. But as PCs and workstations began to proliferate in research laboratories and corporations across America, more and more researchers and managers were obtaining and processing information directly. Librarians and technical information specialists continued to play an important role in obtaining relevant research information, but DTIC was beginning to create more services and tools geared toward the end-users.

CENDI is Formed to Coordinate Agencies' Needs

As DTIC began to expand its networks with other agencies, a need grew for those agencies to coordinate their information efforts. Improving standardization and coordination had actually been a long-standing issue for government agencies involved in R&D. In the post-*Sputnik* era of the early 1960s, when the government was focusing increased attention on scientific and technical information and research activities, at least two special task force reports recommended the formation of a central board, committee, or agency to coordinate information efforts among R&D agencies.[87] These recommendations led to the formation of the Committee on Scientific and Technical Information (COSATI) in 1963.

By the 1970s, however, interest and support for the COSATI had waned, and the

Hubert Sauter
DTIC Administrator
1974-1985

organization was disestablished. Yet the problem of incompatible systems and duplication of effort continued, and the problem was becoming greater as the amount of information being generated increased. In an effort to improve the situation, several agencies involved in scientific R&D began meeting informally to develop ways to enhance the flow and use of scientific and technical information both within and between their organizations.

In 1985, those agencies created a formal grass-roots organization with the mission of creating common goals, procedures, and protocols for collecting, disseminating, and sharing scientific and technical information. The organization was called the Commerce, Energy, NASA, National Library of Medicine, Defense Information (CENDI) group, after its members. In 1995, the group still meets on a regular basis, organizes working groups to address specific issues, and prepares studies, position papers, and information packets on issues relating to interagency communication and information management.[88]

Small Business Innovative Research, University Research Initiative, and Historically Black Colleges and Universities' Programs Established

At the same time as it was expanding its network services and data resources, DTIC was also expanding the community it served. In 1982, the Federal government passed Public Law 97-219, known as the Small Business Development Act. The Act required federal agencies with external R&D budgets in excess of $100 million to earmark 0.1% of their budgets for small business contracts.[89] The goal was both to strengthen the role of small business in federal R&D and to promote the development of dual-use (government and commercial) technology. Although agencies administered the program differently, DoD began by awarding Small Business Innovative Research (SBIR) contracts once a year. An annual solicitation book was published that listed hundreds of topics for which research proposals could be submitted.

For each topic within the solicitation book, DTIC compiled a Technical Information Package (TIP) that contained unclassified/unlimited bibliographic entries from the TR and WUIS databases. The packages were compiled in advance so that individual requests could be turned around in a day. Small businesses could then request reports from that bibliography, and DTIC would provide up to 10 reports free of charge[90] and additional reports for a standard document fee. DTIC's regional offices also would provide follow-up support to companies wanting to submit contract proposals.

Until 1989, DTIC provided support to the SBIR program for only three months of the year, during the formal solicitation period. After FY 1989, however, DoD added a second solicitation period. Realizing that the needs of the small businesses in the program extended beyond the initial proposal stage, DTIC then began to register SBIR companies as DTIC users for the entire year.[91]

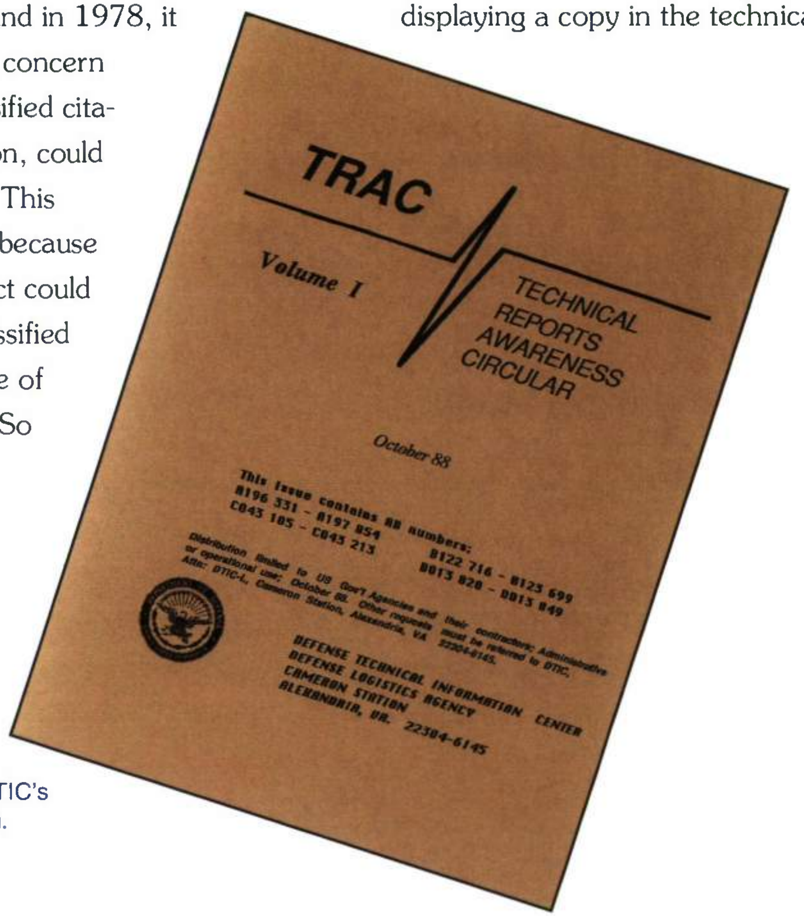
DTIC also began providing additional technical information services to colleges and universities to support the DoD University Research Initiative (URI) and the Historically Black Colleges and Universities (HBCU) programs. Both of these programs were designed to enhance the quality of defense-oriented research at universities. In the case of the HBCU program, the goal was also to increase the universities' awareness of available defense R&D contract opportunities and strengthen their ability to compete for that work.[92]

The *Technical Reports Awareness Circular* Replaces the *Technical Abstract Bulletin*

As DTIC expanded the types of information it provided and the number of people and organizations it served, the Center could never lose sight of the fact that its mission was also to safeguard the security of the sensitive information entrusted to it. This responsibility eventually led to the discontinuation of the *TAB*, which had been DTIC's primary method of announcing new acquisitions in its collection since 1957.

The *TAB* had gone through several stages of classification in its history, as DTIC tried to strike a workable balance between letting users know what was available and making sure it didn't release information inappropriately. From 1957 to 1967, the *TAB* was unclassified. For the next 10 years, it was made a classified publication, and in 1978, it was declassified again. But the concern remained that even the unclassified citations, if analyzed in combination, could disclose classified information. This concern was particularly great because the Freedom of Information Act could force DTIC to release its unclassified *TAB* citations to people outside of its registered user community. So in 1983, the publication was classified again.

The problem with a classified *TAB*, however, was that it severely restricted the number of people who could use it. Approximately one-third of DTIC's registered users did not have facility clearances for classified publications, and therefore could no longer receive the *TAB*. Even those who had the appropriate clearances had to store the *TAB* in a secure area instead of circulating it among the researchers and engineers or displaying a copy in the technical



TRAC replaced *TAB* as DTIC's announcement publication.

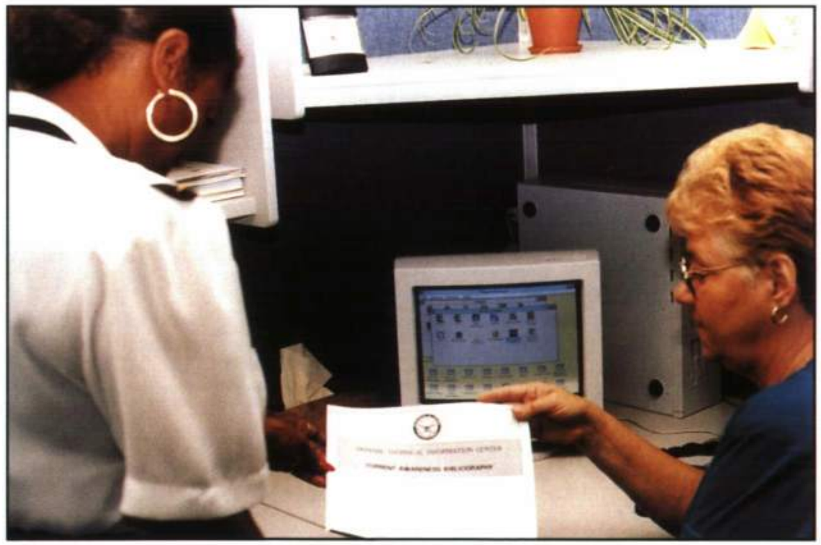
library. Consequently, the *TAB*'s use and usefulness declined sharply. In an effort to create a publication that was more helpful to its customers, DTIC finally replaced the *TAB* altogether with the *Technical Reports Awareness Circular (TRAC)*, which was a completely unclassified publication.[93]

The *TRAC* listed all the new DTIC acquisitions by AD number, but it did not include abstracts or a subject index because those items were considered most likely to indirectly reveal classified information. The problem with this approach, however, was that without abstracts or a subject index, the publication was of limited use to DTIC's customers. Even the *TAB*, which had both of those items, had been too generalized for many researchers and managers in comparison with DTIC's other announcement vehicles. The *CAB*, for example, compared a user's subject-interest profile against newly acquired accessions in the TR database to create a customized list of relevant reports, and DROLS allowed researchers to search quickly for new reports in specific areas from their own computers. Both of these methods were already becoming more popular with DTIC customers. So an unclassified publication with no subject indexes was far too time-consuming for DTIC's users to try to use. Fifteen months after the *TRAC* was initiated, it had fewer subscribers than the most *TAB* ever had, and it was discontinued at the end of 1989.[94]

New Technology Provides New Products

One of the factors that made it possible for DTIC to discontinue a *TAB* or *TRAC* publication was that PCs, online networks, and systems and software had improved dramatically. A bound paper listing of reports was ancient technology compared to a PC that could (through local and long-distance networks) reach databases directly to conduct individualized online searches for information.

Advances in technology were also making it possible for DTIC to provide its customers with a greater variety of products. In 1988, DTIC began working with the Logistics Management Institute to develop a Compact Disk-Read Only Memory (CD-ROM) prototype for its TR database, to be used as an extension to the DROLS capability. The CD-ROM could be sent to customers who could use it to search the database and manipulate the information without even having to connect to the DROLS online service. Another advantage was that the CD-ROM

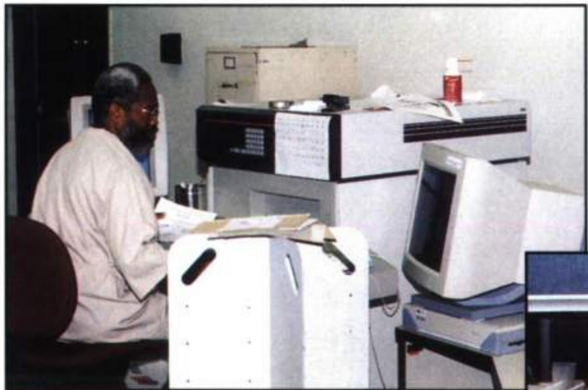


Betty Weatherholz and Illana Banks, of DTIC's Reference and Retrieval Division, discuss a *Current Awareness Bibliography* (*CAB*).

was designed with more modern software, and therefore was much easier to search. The disadvantage of the CD-ROM was that even if it was updated periodically, it would not be as current as the online system. After 2 years of testing and development, an operational CD-ROM product for 20+ years of the TR database became available in 1991.[95]

As more people began to rely on multimedia forms of information, DTIC began to develop other nonprint products. By 1991, customers could submit and obtain information not only in hard copy, but also on computer diskette, video, and magnetic tape. The same year, DTIC instituted a classified dial-up service using a secure telephone unit, STU-III. The service allowed users to access classified information from DTIC databases without a dedicated secure line, thereby reducing the cost of operating a classified DROLS terminal.[96]

DTIC was also beginning to work with technology that would fundamentally transform its basic operations. In 1985, DTIC began looking at Optical Character Recognition (OCR) technology that could convert portions of documents into ASCII text, to eliminate the need to type each abstract and report citation into a computer. The Center also began investigating the possibility of developing an Electronic Document System (EDS) that could automate its paper-based manual system.[97]



Harold Johnson, of the Media Duplication Division, inputs a document into the system.

Gail Chagnon, of the Reference and Retrieval Division, searches the TR database on CD-ROM.

Administrative and Organizational Changes Take Place

Clearly the ways in which information could be processed, transmitted, and used were advancing rapidly. But even as DTIC worked to take advantage of these new capabilities, the Center found itself struggling with the age-old problem that no amount of technology could solve. As the 1990s ushered in an era of shrinking budgets, decision-makers became more concerned with where dollars were being spent and what return was being gained from every expenditure. The problem this presented for DTIC was that it was difficult for the Center or its customers to determine the exact value of the information DTIC provided. Even the classified DROLS users who had stressed the value of timely access to critical information had a hard time putting a specific number on that value.

A 1983 report on the use and value of DTIC products and services noted the following:

> *Unfortunately, there has been no calculus or economic theory developed to measure the value of information. This is partially because in the past there has been no pressing need to do so and partially because of the difficulty in doing so. This difficulty arises largely because of the inability to define or quantify information and to separate information from the product or service used to transmit it.*[98]

The report went on to estimate that based on 12.4 million readings of DTIC technical reports in 1982 and an average savings in time, effort, and expenditure of approximately $4,600 per reading, the value of DTIC's products and services was $37.5 billion a year. And in 1982, a Hughes Aircraft Company executive had estimated that DTIC services could save his company as much as $136 million a year; but these numbers were hard to prove.[99]

A Defense Management Review of DTIC in 1991 also concluded that the Center would be a good candidate for the Defense Business Operating Funds (DBOF) program. With the DBOF program, DTIC would no longer receive an appropriation for its annual budget. Instead, the Center would be responsible for generating 100% of its operating funds by "selling" its various products to customers. User fees were not new at DTIC, but they had always been seen primarily as a way to discourage careless use of the services and, secondarily, as a way to help defray part of the cost of DTIC's operations. Yet having to pay for information could discourage people from using DTIC's services when they were actually needed, and DTIC had always had to work at creating a careful balance between charging nothing and charging too much. Under the DBOF program, however, DTIC would have to charge for more services. A Pricing Review Committee, established in 1991, determined optimum fees for user services and began charging the different branches of the military for professional services.[100]

The DBOF accounting system was instituted at DTIC in 1991. Eventually, DoD managers determined that the program was too great a barrier to DTIC's products and services, and DTIC was switched back to an annual appropriations system in October 1994, although the Pricing Review Committee was kept to oversee any pricing changes or policies. But the switch to the DBOF program still had a big impact on the Center. Obviously, the change impacted DTIC's financial operations, but the events that led to its implementation in the first place also led to a significant change in DTIC's administration and organization. Although manage-

ment review had indicated that DTIC would be a good candidate for DBOF, the catalyst for the change was the fact that DLA's budget submission in 1991 included no funding for DTIC. Seeing DTIC's budget zeroed-out caught the attention of numerous people at the Pentagon and prompted not only the experiment with the DBOF accounting system but also a re-evaluation of the Center's role in the DoD.

DTIC had always received its policy guidance from the Office of the Secretary of Defense (OSD) even though its daily administrative oversight came through DLA. But if DTIC was really supposed to "work closely with R&D managers in the Pentagon and provide them with technical and management information,"[101] the Pentagon officials reasoned that perhaps the Center should be directly under OSD control. So in 1991, DLA General Order 19-91 transferred the administrative as well as policy management of DTIC to the Office of the Under Secretary of Defense for Acquisition and Technology.[102]

The change in DTIC's parent organization signaled both a growing awareness within the Pentagon of the value of information (even if it was hard to quantify) and reflected another expansion of DTIC's user community. Although DTIC and its predecessor organizations had always ostensibly served the Pentagon, the majority of its direct customers had traditionally been technical libraries. That community had been slowly growing over the years to include program planners and man-

agers, and advances in computer technology had added a new group of end users to DTIC's customer base in the 1980s. Now the managers in the Pentagon were adding a new dimension to DTIC's user community and mission description.

DTIC's essential mission had not changed, but the ways in which DTIC conveyed information, the audiences it served, and the types of information it was handling were all expanding. The post-WWII Air Documents Division may have started out as a paper-based technical library, but in order to continue performing a job that was growing in both complexity and importance, DTIC had to evolve into a flexible, resourceful, electronic information processing center.

CHAPTER FOUR

THE INTERNET AND BEYOND

We live in an age that is driven by information. It's an age which Alvin Toffler has called the Third Wave. The ability to acquire and communicate huge volumes of information in real time, the computing power to analyze this information quickly, and the control systems to pass this analysis to multiple users simultaneously—these are the technological breakthroughs that are changing the face of war and how we prepare for war.

—William Perry
Secretary of Defense
May 5, 1994

The new source of power is not money in the hands of a few but information in the hands of many.

—John Naisbitt
Megatrends

As the Defense Technical Information Center moves forward into the last decade of the 20th century and beyond, it is indeed facing a brave new world. In 1947, the growth of scholarly information was measured by the number of documents in library collections, which were doubling every 16 years. Forty-five years later, analysts are no longer counting the number of documents but the amount of information itself, which they estimated was doubling at the staggering rate of every 18 to 20 months.[103]

The fact that analysts were measuring growth rates by looking at raw information instead of numbers of documents indicated how great a change had occurred in information technology. The biggest issue was not merely growth in amount of material but a revolution in how that information was found, disseminated, and used.

The pieces needed to create this revolution had been evolving throughout the 1980s. The expanding use of personal computers and increasingly sophisticated software and networking capabilities had begun to open people's eyes to new ways of finding and using information. But in the

Lance Davis, Deputy Director, Defense Research and Engineering, Office of Technology Transition, and Kurt Molholm, DTIC Administrator, cut the ribbon at a ceremony initiating the Electronic Document Management System.

1990s, those pieces began to come together, transforming the fundamental dynamic of information science from a local service based on supply to a global system based on selection. The information age was not just over the horizon—it had arrived.

Information scientists and computer experts were not the only ones to recognize the enormous power this new information technology could wield. In August 1992, the whole world watched Russian military leaders fail in an attempted coup of President Gorbechev's government. A significant factor in their failure was the fact that advances in communications technology made it impossible for the military leaders to control the information the Russian people and the world were receiving.

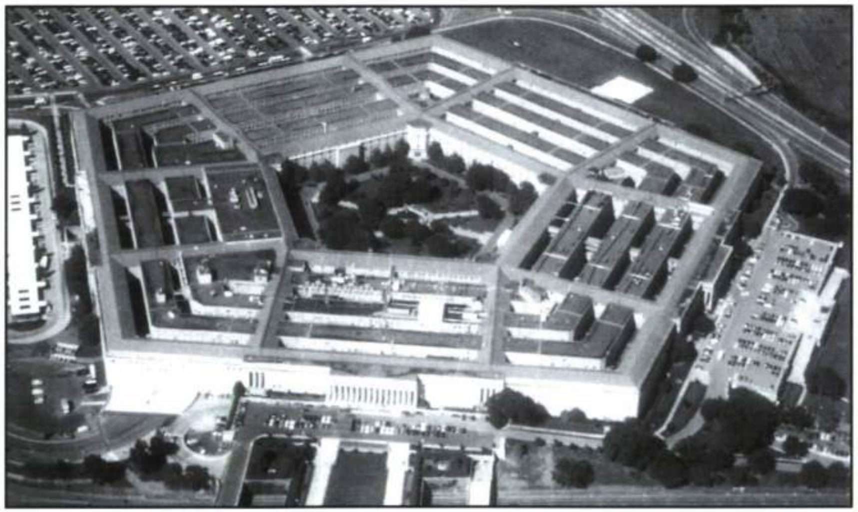
For decision-makers in the Pentagon, the 1991 Gulf War underscored in a dramatic way the importance of immediate and accurate information in high-tech warfare. This experience helped fuel the establishment of Information War Centers within all the branches of the United States military.[104]

The election of President William J. Clinton and Vice President Albert Gore, Jr. in 1992 also brought to the White House two leaders highly focused on the importance of information technology, not only for national defense, but for the nation's economic health, as well. In a publication produced a month after the two men took office, they argued that

> *Where once our economic strength was determined solely by the depth of our ports or the condition of our roads, today it is determined as well by our ability to move large quantities of information quickly and accurately and by our ability to use and understand this information.*[105]

This was the environment, then, when the management of DTIC was transferred from the Defense Logistics Agency (DLA) to the OSD. The government's growing awareness of the importance of information was creating the need, and advances in technology were creating the ability for DTIC to assume a broader and more important role within DoD.

Throughout the 1970s and 1980s, DTIC had been gradually building an infrastructure to acquire, process, access, and disseminate more diverse types of information. Through resources such as the Program Planning, Independent Research & Development (IR&D), and the Manpower and Training



Administrative control of DTIC was transferred to the Office of the Secretary of Defense at the Pentagon in 1991.

Members of the Research, Development, and Acquisition Information Support Directorate (DTIC-A) discuss the development of DefenseLINK. From left to right: Marcie Stone, Shelley Ford, Carlynn Thompson (Director) and Scott Douglas.

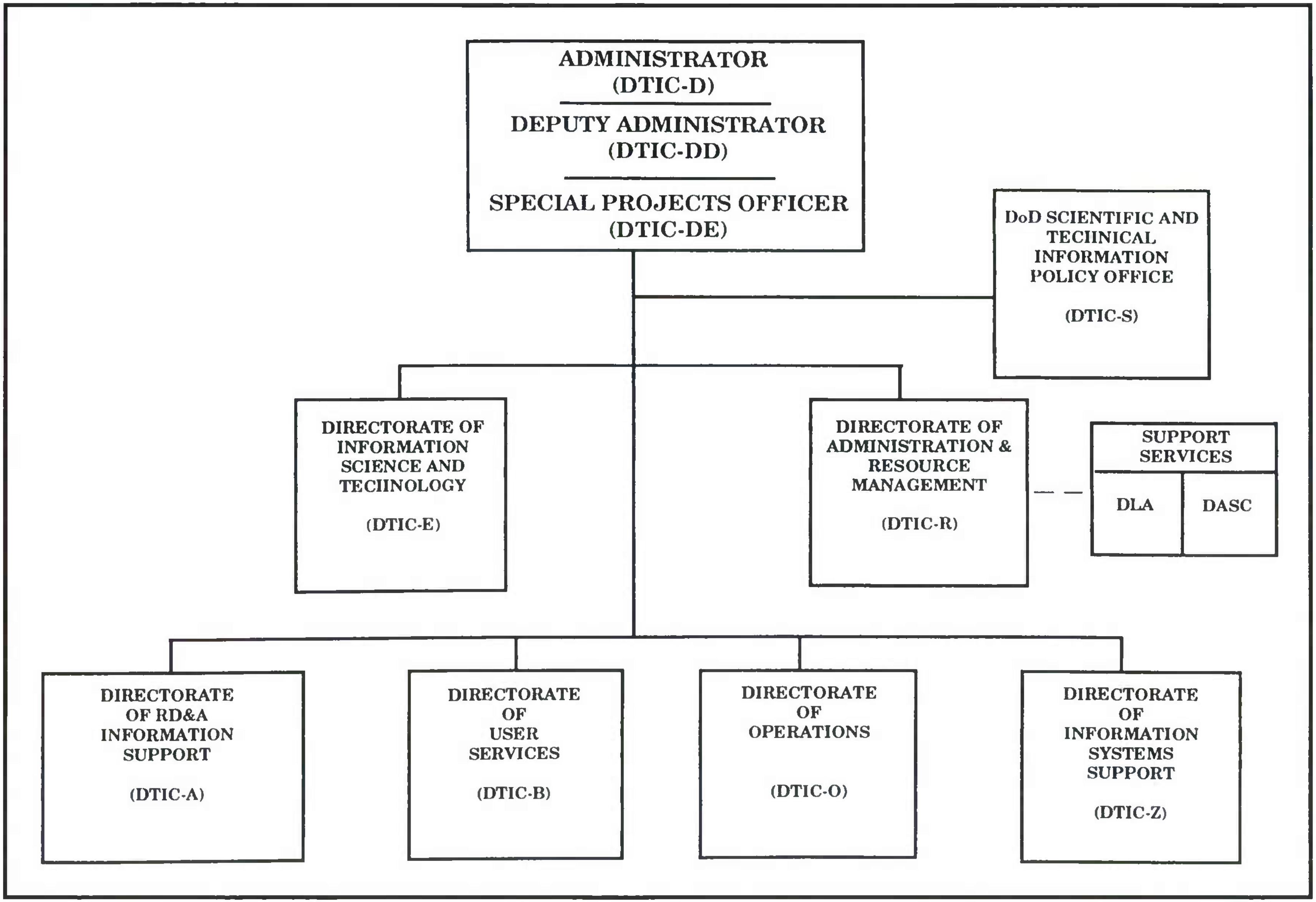
Information System (MATRIS) databases, DTIC began to expand from its initial technical report focus to include more management-oriented information. The addition of the Information Analysis Centers (IACs) and the development of the Department of Defense Gateway Information System (DGIS) further broadened DTIC's capabilities and scope.

But DTIC's move to OSD gave it something it did not have before—the ability to work directly with high-level decision-makers within the Pentagon. Managers at DTIC realized that this new group of customers had information needs different from those of their traditional user community. But the managers also realized two other important facts. First, DTIC was well positioned to provide an important resource to these officials as they struggled to adjust to an information-driven world. And second, if DTIC wanted to avoid becoming an obsolete repository, it had to be flexible enough to continue expanding the types of information it provided and the audiences it served. The world was changing; the information needs of the DoD R&D and management communities were changing; and DTIC had to keep up with them if it wanted to continue to serve a relevant function within the DoD structure.

DTIC-A is Formed to Support the Pentagon

In order to better serve the needs of the decision-makers at the Pentagon, DTIC revised its internal organization. In addition to directorates for operations, user services, resources, development and testing, information technology, policy, and administration, DTIC added a directorate responsible for serving users at the Pentagon and handling management-oriented information. The new organization was called the Research, Development & Acquisition Information Support Directorate, or DTIC-A. In addition to offering support services to OSD, it was given responsibility for the IAC program, which by then included 14 facilities, and the MATRIS operations and database.

DTIC's managers recognized that senior-level decision-makers at the Pentagon did not have the time or inclination to search through multiple databases for information. DTIC's business plan for 1993-1997 noted that, "Acquisition managers and decision-makers...desire current, concise, specific information...within relatively short timeframes. They are more interested in the



The chart shows the DTIC organization as it has been since 1991.

possible benefits, costs, and consequences of selecting a particular technology or course of action as opposed to the internal nature of individual technologies."[106] To be of service to this audience, therefore, DTIC-A had to provide Pentagon executives and managers with highly customized services and more synthesis and analysis of information than DTIC was accustomed to providing its users.

While DTIC-A could accomplish these tasks for the relatively small group of Pentagon officials, DTIC was not staffed nor equipped to offer that level of service to its entire user community. But it could develop tools to help its customers find, analyze, and synthesize the information they needed to make decisions or conduct their research projects.

There was a growing realization within the Defense R&D community that the information needs of a successful R&D program stretched far beyond just scientific and technical information. Information on acquisition procedures or testing limitations and regulations, for example, might not contain scientific data per se, but it was critical information to have in order to conduct scientific research. And as budgets for R&D declined, it was more important to make sure that federally funded research efforts were managed and executed as efficiently as possible.

Emerging Technologies Spur Creation of Network

To help the R&D community gain access and easily search relevant information, DTIC established the Scientific and Technical Information Network (STINET) office in October 1992. The goal of the office is to use emerging information technologies to help the R&D community network their personnel, resources, and information more effectively. The STINET office continues to assist users in preparing documentation to procure library automation systems, offers electronic services such as the STINET service, and manages the DGIS and GoldenGate services.

DTIC-A and the STINET office also began to make use of another piece of emerging information technology that was probably the single most significant factor in the information revolution. It was, furthermore, the technology that made possible many of the new services and information retrieval tools DTIC was developing for its expanding base of users. In one sense, it was only another computer network. But the Internet, or "The Information Superhighway," as it became popularly known, provided the last critical link to move business and government from paper-based systems into the electronic information age.

The Internet Arrives

The Internet began as a rudimentary computer network developed by the Advanced Research Projects Agency (ARPA) in the late 1960s. In the early 1980s, the National Science Foundation (NSF) began developing its own network based on a series of regional networks to link researchers with five NSF supercomputer centers. In 1985, the ARPAnet was incorporated into the NSFnet. Numerous other computer networks had developed over that same period, but there was little, if any, inter-network capability. The NSF network, however, began connecting many of the smaller networks that existed not just around the country, but around the world. The result was the International Network of Networks, or Internet.[107]

DTIC's Computer Room Tape Library once held over 10,000 tapes. Since the installation of the silos, over 5000 tapes have been converted to tape cartridges and are stored inside the silo.

The Internet represented a quantum leap forward in the amount of information available to anyone hooked into the system. But by the same token, this created a staggering overload of information for users to sort through to find the item or items they needed. Soon people working with the network began to develop tools that would help users navigate through the Net, such as Wide Area Information Service (WAIS) and "gophers."

Recently, Internet technology advanced even further with the development of the World-Wide Web (WWW). The WWW uses hypertext and hypermedia to link documents or multimedia information such as graphics, sound, and video. By clicking on certain words or phrases, a user can instantly jump to a number of different documents or items having to do with that subject.

Advances like these have contributed to an astounding growth rate in use of the Internet. In 1985, there were an estimated 2,000 hosts on the NSF network. Ten years later, the Internet linked approximately 46,000 separate computer networks and included more than 4 million hosts. Interest in the WWW has grown even faster, increasing at an estimated annual growth rate of 431,634%.[108]

DTIC's Internet Connections

As the Internet's technical capabilities advanced and as it became clear that it would gain widespread acceptance, DTIC began to explore the Internet to inform users and potential users about the services the Center could offer to help users navigate through the wealth of information appearing on the Internet and to offer additional diverse but highly targeted services. Because of security concerns, classified information could not be disseminated over the Internet, but there was much unclassified information that DTIC could either provide or help its customers locate and use.

Within the STINET office, for example, DTIC created a customized service using the WAIS technology to help the R&D community connect with password-protection to databases relevant to defense R&D. DTIC's WAIS also simplified searches because a user only had to develop a single search strategy, which could be created in natural language terms or Boolean logic instead of learning the complexities of each database search strategy. The WAIS service searches databases individually or simultaneously and generates a response for the user ranked according to the number of times key words appear in any given item. WAIS thus represented another step by DTIC to open up direct access to electronic information for persons not accustomed to searching databases.

DTIC's STINET service provided a variety of information produced by DTIC and other sources. It offered many DTIC products in a WAIS-searchable format. These databases include the unclassified, unlimited portion of the last 10 years of DTIC's Technical Report (TR) bibliographic database; DTIC directories, such as the *How To Get It* and the *Directory of Resources*, and several commercially obtained news services, such as *Defense Daily*. In addition, users could search the DoD Directives and Instructions and download the documents themselves. The STINET service linked users to other WAIS databases and provided online ordering of documents from DTIC and other organizations. Other databases and general information will be added to the STINET service as it continues to grow.[109]

The Center also created its own Home Page that gives users a logical starting point in searching for DoD information. Not only does DTIC's Home Page allow users to link to DTIC's regional offices and various departments within DTIC to obtain documents or assistance, but it also links users to STINET and the DTIC Web, which in turn provides access to sources such as the DoD locator, news and current events, scientific and technical information, and the DoD Information Analysis Centers. Another WWW service, DefenseLINK, was developed by DTIC as a joint project with OSD Public Affairs and the Assistant Secretary of Defense for Command, Control, Communications, and Intelligence. DefenseLINK—the DoD Home Page—provides a single entry point, allowing users to electronically link to the Home Pages that offer information about OSD organizations, Defense agencies, and the military services. In addition, DefenseLINK

DTIC's Home Page allows users to link to functional areas within DTIC and to the Center's regional offices. URL: http://www.dtic.dla.mil

OSD Public Affairs provides access to its press releases through DefenseLink. URL:http://www.dtic.dla.mil/defenselink

News provides access to all press releases issued from the OSD Public Affairs Office, including transcripts of DoD news and background briefings, contract award announcements, press advisories, and other information. At the request of the Director of Laboratory Management, DTIC also developed the Laboratory Information Infrastructure, which uses the WWW to enable the Laboratory management staff to communicate with and gather information from the 81 DoD laboratories throughout the world; it also provides for information transfer among the laboratories and between the laboratories and the general public to facilitate opportunities for collaboration and partnership.

DTIC also developed a Public Access Gopher (the DPAG) to help DoD communicate with a wider audience. The DPAG, for example, allows the public to download documents and access external information resources such as Cooperative Programs for Reinvestment (CPR), the Small Business Innovative Research (SBIR) program, and technology transfer organizations.[110]

(Top) Diane Stinger from DTIC's Special Programs Branch uses HyperText Markup Language (HTML) to prepare a document for DTIC's Home Page. (Middle) Clarence Mc Cloud, Jessie Duvall, and Julia Foscue receive instructions from DTIC's SBIR Program Manager, Richard Sparks. (Bottom) Dave Shaklee (left) and Narith Tith from DTIC's Support Systems/Integration Division examine a PC modem and resolve and repair the problem.

Although DTIC's official mission does not include serving the general public and not all of these resources fall under the explicit heading of scientific and technical information, DTIC's Home Page and public access gopher provide an important service to OSD. DoD and its contractors were facing increasing pressure to downsize, to develop dual-use (military and commercial) technology, and to engage in technology transfer activities. Improving access to government information and research program resources was one way the DoD could improve its technology transfer activities and help its community remain effective despite the changes it was undergoing.

Creating and maintaining Internet sites was a new kind of service for DTIC, but its business plan for 1993-1997 stated that the Center needed to "assume a more central role in new DoD-wide initiatives in technology transfer, defense conversion, and dual-use applications."[111] Its long-range strategic plan noted that helping to fill "gaps in DoD's information systems...is surely within DTIC's capability," and "if it is not within a narrow reading of our mission, it is within a broad reading of it."[112] Furthermore, DTIC had the infrastructure, knowledge, and resources to perform tasks such as setting up an Internet server without adversely affecting its other services.

DTIC's expertise in acquiring, handling, and disseminating information in both traditional and the new electronic formats led it to take on other unusual tasks. Its support was needed for the DoD National Media Pool, which accompanies the military to an area of operations and sends reports back to other participating media organizations. The biggest difficulty with this system was one of logistics. Reports by the pool had to be reviewed officially to make sure they did not contain sensitive or security-protected information and then disseminated as quickly as possible but only to the other members of the pool.

Limited distribution of information was DTIC's specialty, however, and with the aid of satellite and Internet technology, the Center also had the ability to acquire and disseminate information quickly. When the U.S. military prepared for a possible invasion of Haiti in 1994, DTIC was called on to set up a system to handle DoD National Media Pool releases on the action. The reports, once cleared through OSD Public Affairs, would be sent via satellite to the Pentagon and automatically transferred to DTIC, which would then put them on the Internet, with access limited to the DoD National Media Pool members. Although the Media Pool was not activated in Haiti, the system was successfully used for two subsequent operations and remains ready for future deployments.

DTIC's ability to organize and disseminate information also led the intelligence community to approach the Center about incorporating "gray literature" into DTIC's collection. Gray literature is foreign materials such as brochures, reports, or news items that can be obtained without using covert methods. The intelligence community gathers and uses this kind of material to glean information about possible technology or weapons-development efforts being conducted by foreign governments. It might take an agency 6 months to complete processing this information, however, and disseminating it to any of the other intelligence agencies or their personnel was difficult. DTIC could process that same information in 2 weeks, and procedures for disseminating it were already in place. So although gray literature was also not a traditional component of DTIC's databases, DTIC began working with the intelligence community to incorporate, process, and disseminate that kind of information, as well.

Upgrading DTIC Products and Services

In addition to broadening the type of material it handled and the community it served, DTIC was also using evolving information technology to improve its existing products and services. Personal computers, for example, had improved greatly throughout the 1980s and early 1990s. While a megabyte of memory had once been a significant resource, computers now had access to not just megabytes but *gigabytes* of memory.

As desktop computers became more capable and more widely used, DTIC developed software to help its customers input information into the WUIS and IR&D databases. The software allowed users to create the necessary summary forms on their personal computers so that the information arrived at DTIC correctly formatted and ready to put into the appropriate database. The system reduced the amount of work involved for both the users and the DTIC staff and decreased the amount of time required to incorporate new information into the WUIS and IR&D databases.[113]

Computer-user interfaces had also improved dramatically since the mid-1980s, following Apple Computer's lead with graphical, "point-and-click" software designs. DTIC's users had always complained that its databases were difficult to search, so the Center began working on graphical user interfaces (GUIs) to make it easier to work with databases. A TR GUI was developed for dial-up users of the unclassified TR database. It will also be available to classified users via a STU-III. Instead of typing lines of abbreviated computer commands, the TR GUI used a "Windows" environment to allow users to conduct searches through menus and point-and-click techniques.

To serve DTIC's mission of making it easier for end users to identify and retrieve information from diverse sources, DTIC developed GoldenGate, a system with an easy-to-use GUI. Both the personal computer and Macintosh versions of GoldenGate provide a single point of access to hundreds of databases through a graphical interface that allows end users to formulate effective queries for searching those sources. The sources include DTIC's databases as well as government and commercial databases. An online animated tutorial is accessible from within the program as a

GoldenGate screen helps scientists, engineers, and managers find information sources.

friendly help program, taking the place of cumbersome hard-copy user guides. With GoldenGate, the TR GUI, and the STINET service all reducing the difficulty of searching the DROLS databases, DTIC no longer needed the SearchMAESTRO interface. Consequently, SearchMAESTRO was discontinued in October 1994.[114]

At the same time DTIC was trying to make access to its DGIS databases easier, it was also trying to expand the usefulness of the DGIS network to more of its customers. DGIS had always been a strictly unclassified system, but DTIC began to look at the possibility of creating a secure gateway network able to protect classified information. The difficulty in such a system was how to guarantee that the information would never be released to an unauthorized computer or user, but DTIC also realized the importance of widening the resources available to its classified users and its unclassified customer base.

As the world advanced further into the electronic information age, multimedia capabilities became more important. DTIC was already accepting and disseminating information on videotape, computer disk, and CD-ROM formats. By 1995, DTIC was producing its own CD-ROM products for the IR&D database and the unclassified portion of the TR database and was working on a CD-ROM for the WUIS database, as well.[115]

DTIC was also improving the ease with which customers could access its products by organizing a payment system that allowed users to pay for reports, online services, or products with credit cards. Previously, users were required to have an account with the National Technical Information Service (NTIS) to access those DTIC services for which there was a fee. This sometimes caused delays or difficulties for individual researchers. DTIC also instituted a system to allow users to order documents directly by email, fax, and online, as long as they knew the AD number of the report they needed.

Omniport Concept for WWW

One of the biggest problems the DTIC of the 1990s faced was the staggering rate of advancement in information technology. By the time a product was developed, tested, and released, there was often a better approach available or on the horizon. For example, even as GoldenGate and the STINET WAIS became operational, DTIC found itself working on a more advanced concept. Omniport, as it was called, was a search mechanism for multiple databases using the WWW technology. Gophers, WAIS systems, and the common command language portion of GoldenGate were search mechanisms, as well, but the Omniport concept had important differences.

First, one of the motivating factors behind the development of Omniport was the need to link the different databases of all 26 DoD IACs. While they were all available through some kind of online database management system, several of these "legacy" databases had been created some time ago, and not all of them were configured in any kind of Internet protocol. As opposed to a WAIS or gopher, which could only search information that had been put up on an appropriate server, Omniport was designed to retrieve information from many different databases, regardless of how they were configured or whether they were on a WAIS, gopher, or other kind of system. Using the Internet's WWW and the Minerva Middleware software developed by Booz, Allen, and Hamilton, Omniport could also search all of those databases simultaneously by using a single, natural-language search query. This made Omniport a very flexible search mechanism.

Second, Omniport was designed to allow "concept" searches, instead of being restricted to searches based only on key words. This was a significant advancement in software, and it meant that Omniport could conduct richer and more inclusive searches than existing systems. As with the other products being developed to take advantage of the Internet, the initial version of Omniport was designed to handle unclassified information only. How far its eventual application would go remained to be seen, but by the spring of 1995, a promising proof of concept version of Omniport was undergoing operational testing.[116]

The Electronic Document Management System is Implemented

One of the most significant new systems made possible by advances in information technology was the Electronic Document Management System (EDMS), which DTIC began implementing in 1995. More than simply another new service, the EDMS represented a fundamental shift in the core commodity around which DTIC was organized. For 50 years, despite advances in how its information was disseminated to users, DTIC had always based its collection on paper copies of documents. The goal of the EDMS, however, was to move DTIC from the current microfiche-based document and retrieval system toward a system in which information could be input, stored, retrieved, and delivered electronically.

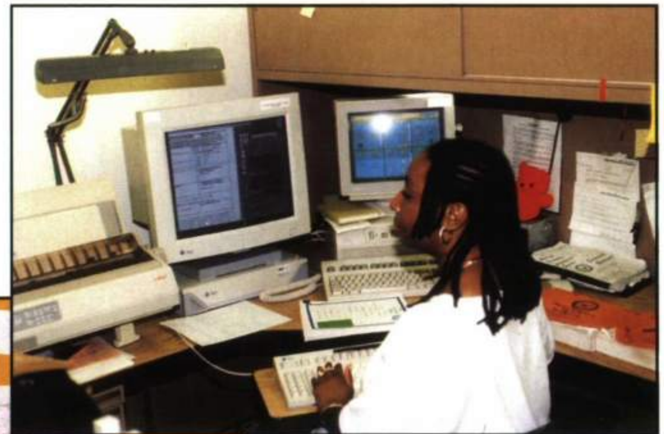
DTIC had actually taken the first steps toward this kind of system with the PC-based software for the WUIS and IR&D databases. The software allowed researchers to submit the one-page summaries that made up those databases on computer diskettes. Converting the TR database to an electronic system was a much more complex task, but as computers, software, and other peripherals became more capable, it became an achievable goal.

The first phase of the EDMS, which was implemented at the beginning of 1995, eliminated the manual handling of paper documents during processing because the entire report was scanned when it arrived. The analysts cataloged, abstracted, and indexed work with the electronic image rather than the hard copy of the report. An OCR software product was used, as appropriate, to convert portions of the report to text, and a machine-aided indexing (MAI) program had been incorporated to generate a list of potential indexing terms, which an analyst could accept, discard, or change. A high-quality, computer-generated microfiche was made of the entire report, and the report was then transferred to an optical disk for storage. Paper copies of documents for distribution could then be produced from the image stored on optical disk, not from microfiche.

The eventual goal of the EDMS is to create a system where document input could be achieved online, as well, eliminating the need for any paper transfer. However, electronic transfer of documents into DTIC's collection would only work if more commonality could be achieved in producing the reports in the first place. Chances are good that this can be accomplished, although it will probably take several years.[117] In the future, DTIC's users will be able to search and access the full text of documents directly from their PC workstations.

Yet with all the talk of electronically based storage and retrieval systems, the Internet, and new information technology, DTIC knows that not all of its users are plugged into the electronic information age. An IAC in Alabama, for example, was surprised to discover that one of the companies it was working with did not have a fax machine with which to receive information, much less an Internet connection.[118] Other users have not yet become Internet-literate nor do they have the desire to conduct their own searches. Consequently, there is still a need for the professional librarian, as well as trained DTIC staff people.

In recognition of this fact, DTIC opened another regional office in May of 1994 in Dayton, Ohio. Most of its customers are small contractors who are bidding for defense contracts, as opposed to companies who are already working with the DoD. DTIC management believes that the personal contact is important to maintain because "machines may not be able to elicit the kind of thought process that allows clients to realize what it is they don't know."[119] For the same reason, DTIC now staffs an 800-number Customer Service Help Desk (1-800-CAL-DTIC) at its headquarters, to give customers a central place to call for assistance and direction.



Zena Rogers catalogs a document using the digital images produced by the EDMS.

Tim McCleerey and Tarnyal Mitchell staff the Help Desk at DTIC Headquarters.

DTIC Technology Helps Field Applications

Several studies of federal R&D have concluded that "successful technological innovation rests more with the transfer and use of knowledge than with its production."[120] A particularly dramatic example of this is the development of stealth aircraft technology in the U.S.

In 1971, a Russian scientist named Pytor Ufimtsev wrote a research paper on the "Method of Edge Waves in the Physical Theory of Diffraction." It was not widely disseminated within Russia, but it was translated by the Air Force and incorporated into DTIC's Technical Report collection. Eventually, it found its way into the hands of the engineers at the Lockheed Corporation's advanced "Skunk Works," in California. There it proved the "Rosetta Stone" of stealth technology, providing key information in how to mathematically analyze radar signatures. In fact, one of the lead engineers on the F-117 Stealth Fighter aircraft concluded that Ufimtsev's paper was the basis of 30% to 40% of the computer programs used to design the F-117. The Russians had the key to stealth technology within their own scientific community—but that knowledge was not transferred or used, so it was the United States, not Russia, that developed the Stealth Fighter.[121]

This example is a particularly relevant one, showing how the information provided by DTIC plays an important role in research endeavors. The National Technology Transfer Center reaches into DTIC's database every day to help connect businesses with people and agencies in the government who are working in the same technology field.

Similarly, the DTIC-managed IACs have provided military commanders with critical, timely information on numerous occasions that has solved problems in the field or saved the government a significant amount of money. During the Gulf War, for example, Iraq's leader, Saddam Hussein, threatened to use biological or biochemical warfare. To defend against this threat, the U.S. troops needed special protective gear, but the military did not have a sufficient amount of this equipment. An emergency request was made to the Chemical Warfare/Chemical and Biological Defense IAC (CBIAC) to find the equipment in stock anywhere in the world that would meet the U.S. military specifications for chemical/biological defense gear. CBIAC was able to supply the information within hours, giving the U.S. military troops access to critical defense equipment.

In another example, the U.S. Army's entire Black Hawk helicopter fleet was grounded soon after it was fielded because of a question regarding the safety of the aircraft wiring systems. The only solution seemed to be to strip the wiring out of all the aircraft to inspect it for problems, but this approach would have left the front-line equipment grounded for a significant amount of time and could have cost hundreds of millions of dollars. The Nondestructive Testing IAC (NTIAC), however, was able to locate information that showed how the systems could be tested without taking the helicopters apart. The technique recommended by NTIAC cost only $50,000 and had the aircraft operational again within weeks.[122]

When the U.S. was preparing to invade Haiti in 1994, the military once again benefited from the services of a DTIC-managed IAC. The Army Communications Electronics Command realized that there was no functional communication network available in

Haiti to support operations there. Within 10 days, the Guidance and Control IAC (GACIAC) was able to devise a command, control, and communications system with satellite and cellular capabilities by using off-the-shelf equipment available in the U.S. In addition to its use in Haiti, this innovative system was subsequently deployed to Korea; to the 18th Airborne Division at Fort Bragg, North Carolina; and to the Redstone Arsenal in Huntsville, Alabama. The system costs $250,000 to install, but the Army estimates that it saves almost $800,000 a month in communications costs.[123]

Future Challenges and Directions

As DTIC begins its second 50 years of operation, it finds itself with its core mission essentially unchanged but with the technology, methods, and specific tasks required to fulfill that mission changing continuously. New information technology has created more opportunities to change the ways DTIC communicates with its community, but this has created new challenges, as well.

DTIC's mission has always been to serve DoD by managing and disseminating information to improve scientific and technical research and development programs. But technology once limited that job to collecting and disseminating technical reports. Computers and online systems created more options

DTIC's directors plan for the challenges of the future. Left to right: Barbara Lesser, Betty Fox, David Appler, Kurt Molholm, Paul Ryan, Larry Jenkins, Ron Hale, Pete Suthard, Jim Erwin. (Missing from photo: Carlynn Thompson.)

for accessing and delivering information, but they also created an even greater body of data to manage. This greater body of data, in turn, created the need for additional tools and services. Providing these additional tools and services again increased the use of information, which then created a greater need for tools to work with that growing supply of information. In a seemingly never-ending cycle, need has led to technological development, which has led to increased need, which has led to more development.

Through this process, DTIC developed both systems and expertise for managing information, which has led managers to rely on the Center for additional tasks, as the information and communication needs of the DoD have expanded. DTIC's revised long-term strategic plan, published in 1990, noted that

> *Growing recognition outside of the scientific community of the importance of STI (scientific and technical information), international economic competition, and continued extraordinary growth in information technology will be the greatest forces of change for DTIC in the 1990s.*[124]

In some ways, the advances in information technology have created an ironic closing of the circle that was started by the agency in 1945. The economy and the information community have become much more global since the early days following WWII. But this shrinking distance has made foreign competition a greater concern to scientists, engineers, and managers, both inside and outside DoD. The threat to national security is now not only military but economic, as well. In 1986, for example, U.S. imports exceeded exports for the first time, creating an overall trade deficit of $136 billion.[125]

Taking advantage of all the possible information sources available is critical if U.S. industry is to remain competitive in an increasingly global economy, which, in turn, is critical in maintaining a strong national defense. Consequently, DTIC has renewed its efforts to collect and incorporate foreign material into its collection. Knowing what others in the U.S. R&D community are doing is not sufficient in a global environment—researchers need access to what is going on all around the world.

The growing interest in foreign material is just one example of how the needs of DTIC's users and DTIC's user community itself are changing and expanding. DTIC's customers need more information and more types of information. But with access to far more material than anyone has time to sort through, DTIC users then need assistance in pinpointing that one needle in a haystack of data that is helpful for their particular problem.

DTIC's goal is to be an organization that helps people find and use the information they need no matter where it resides and in a context and format they need and can use most readily. All of the new products and services DTIC has created or is in the process of developing are geared toward this goal. It is a tough assignment, however, and DTIC will face a number of challenges along the way.

One of the biggest ongoing challenges will continue to be keeping up with the rapid

Artist's rendering of DTIC's new location in the Headquarters Complex at Fort Belvoir, Virginia. The Center relocated to the new site in September 1995.

Information provided by DTIC helped the U.S. military forces during the Persian Gulf War.

pace of change in information technology. Analysts predict that the impact computers have had in the last 30 years will be dwarfed by what will occur in the next 15. In fact, Vice President Gore compares the significance of the electronic information revolution to the invention of the printing press since both fundamentally changed how information could be published and disseminated.[126]

In the midst of this evolving technological revolution, DTIC must find as many ways as possible to expand the amount of information available to its users while providing tools or methods to help keep that information from becoming overwhelming. In the process, DTIC has to ensure the security of sensitive and classified information and guarantee the validity and integrity of the material it is providing. Furthermore, as the information base expands so rapidly, these become more difficult tasks. The Internet, for example, creates many more options for finding and disseminating information, but it also brings new concerns, such as security of the information being transmitted over the network and copyright or intellectual property restrictions.

DTIC also has to deal with the fact that all of its users do not have the same level of technological sophistication. So whatever tools and solutions the Center develops must be flexible enough to serve both novices and experts. Complicating this problem is the fact that information technology is constantly outdistancing itself. It is difficult for DTIC to develop long-term solutions for its users' needs when technology is changing so rapidly. DTIC's staff, as well, are hard pressed to keep up with the rapid pace of change in the technology, products, services, and expectations within the organization. Cultural change within an organization is never easy, and DTIC has undergone a tremendous amount of change over its 50 year history.

DTIC was faced with another challenge and opportunity in September 1995, when it moved its headquarters to a new location. Cameron Station, DTIC's home for more than three decades, was on the list of bases to be closed in 1995. DoD wanted DTIC to remain in the Washington, D.C. area, so DTIC moved into newly constructed quarters at Fort Belvoir, Virginia.

Conclusions

All of these challenges are worth meeting because the job DTIC does is important, both to the economic health of the country and to its national defense. Information technology has changed dramatically in the past 50 years, but information is still as powerful a tool and weapon as it ever was.

Clearly, having access to sources of information can be a critical money and life-saving resource in both military operations and defense-related research. Use of DTIC's information services is also increasing as its customer community expands. Soon after

DTIC initiated its WWW server in October 1994, it was being accessed an average of 1,800 times a week. Seven months later, that number had jumped to 150,000.[127] These trends will only grow stronger as technology and the information needs of the Department of Defense continue to evolve.

Over the last 50 years, the ways in which DTIC has carried out its mission have changed. Indeed, its history parallels the evolution of the information age itself—from a paper-based world of 3-in. by 5-in. catalog cards and rooms full of yellowing technical reports—to a worldwide electronic information web, allowing instant access to minute pieces of multimedia information. DTIC has had to grow from a simple repository to a multimedia information center, with the flexibility and capability to provide a wide variety of information resources and services to the DoD community. Some of the services it now provides could not have been imagined by those who set up the Air Documents Division and the Central Air Documents Office in the 1940s. But regardless of the specific technology, products, services, or customers, the fundamental mission and purpose of the Center have never changed.

No matter what the medium, content, or dissemination method, DTIC's job has always been to help people use information as efficiently as possible to strengthen the nation's defense. And as DTIC enters the 21st century, the importance of information will only increase, not just for specific DoD projects, but also for the health of the national economy that supports those projects. Information technology may change, but one important fact about it will not. *Knowledge was, is, and will continue to be power*. And as long as that is true, the Defense Technical Information Center will continue to play an important role in maintaining the economic and military strength of the United States, into the millennium and beyond.

NTIAC found information that answered safety questions about the Army Black Hawk Helicopter.

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GLOSSARY OF ACRONYMS

AD	ASTIA Document; later Accession Document
ADD	Air Documents Division; Automatic Document Distribution (program)
ADRC	Air Documents Research Center
ARPA	Advanced Research Projects Agency
ASTIA	Armed Services Technical Information Agency
ATI	*Air Technical Intelligence; Air Technical Index*
CAB	*Current Awareness Bibliography*
CADO	Central Air Documents Office
CBIAC	Chemical Warfare/Chemical and Biological Defense IAC
CDI	*Captured Documents Index*
CD-ROM	Compact Disk-Read Only Memory
CENDI	Commerce, Energy, National Aeronautic and Space Administration, National Library of Medicine, Defense Information (Group)
COSATI	Committee on Scientific and Technical Information
CPR	Cooperative Programs for Reinvestment
DBOF	Defense Business Operating Funds
DDC	Defense Documentation Center
DGIS	Department of Defense Gateway Information System
DoD	Department of Defense
DLA	Defense Logistics Agency
DPAG	DTIC Public Access Gopher
DROLS	Defense RDT&E Online System
DSA	Defense Supply Agency (became DLA)
DTIC	Defense Technical Information Center
EDS/EDMS	Electronic Document System/Electronic Document Management System
FY	Fiscal Year
GACIAC	Guidance and Control IAC
GUI	Graphical User Interface
HBCU	Historically Black Colleges and Universities program
IAC	Information Analysis Center
IAS	Institute of Aeronautical Sciences
IDA	Institute for Defense Analysis
IR&D	Independent Research and Development
LAM	Local Automation Model (precursor to STILAS)

MAI	Machine-aided Indexing
MARS	Machine Retrieval System
MATRIS	Manpower and Training Research Information System
NASA	National Aeronautics and Space Administration
NRS	Naval Research Section
NSF	National Science Foundation
NTIAC	Nondestructive Testing IAC
NTIS	National Technical Information Service
OCR	Optical Character Recognition
ONR	Office of Naval Research
OSD	Office of the Secretary of Defense
OSRD	Office of Scientific Research and Development
R&D	Research and Development
RDT&E	Research, Development, Test, & Evaluation
RSAG	Resource Sharing Advisory Group
SAIS	Standard Aeronautical Indexing System
SBIE/SBIN	Shared Bibliographic Input Experiment/Network
SBIR	Small Business Innovation Research
STILAS	Scientific and Technical Information Library Automation System
STINET	Scientific and Technical Network
STINFO	Scientific and Technical Information
TAB	*Title Announcement Bulletin*; later the *Technical Abstract Bulletin*
TIP	Technical Information Pilot; Technical Information Package (in SBIR program)
TIS	Technical Information System
TR	*Technical Report*
TRAC	*Technical Reports Awareness Circular*
URI/URS	University Research Initiative/Support Program
WAIS	Wide Area Information Service
WUIS	Work Unit Information System
WWW	World-Wide Web
ZWB	Germany's Center for Scientific Information on Aeronautical Research

DTIC TIMELINE

1944 Air Force Air Technical Intelligence teams begin fanning out across Europe, seeking aeronautical research materials

1945 The Air Documents Research Center (ADRC) is established in London to process captured documents

1945 The ADRC is renamed the Air Documents Division (ADD) of the Intelligence (T-2) Department of the Headquarters, Air Technical Service, Army Air Force

1945 Eight-hundred thousand captured documents are flown to the ADD office at Wright Field in Dayton, Ohio

1947 The Institute of Aeronautical Sciences develops a Standard Aeronautical Indexing System for cataloging technical reports

1947 The ADD completes the Captured Documents Index (CDI) project

1948 The ADD is renamed the Central Air Documents Office (CADO) and given a broader mission

1949 CADO is separated from the Intelligence Department and established as an independent military agency

1950 CADO opens up its first regional office, in Los Angeles

1951 Secretary of Defense George C. Marshall issues a directive establishing the Armed Services Technical Information Agency (ASTIA)

1952 CADO is taken over by ASTIA and renamed the ASTIA Document Service Center

1953 The Naval Research Section (NRS) is taken over by ASTIA and renamed the ASTIA Reference Center

1953 Publication of the *Title Annoucement Bulletin* (*TAB*) begins

1957 The *Title Announcement Bulletin* (*TAB*) becomes the *Technical Abstract Bulletin* (*TAB*)

1958 ASTIA relocates both the ASTIA Document Service Center and the ASTIA Reference Center in Arlington Hall Station, in Arlington, Virginia

1959 ASTIA awards a contract to Remington Rand for its first computer

1960 ASTIA's two Remington Rand Solid State 90 computers become operational

1963 ASTIA is renamed the Defense Documentation Center for Scientific and Technical Information (DDC)

1963 DDC moves from Arlington Hall Station to Cameron Station, in Alexandria, Virginia

1963 DDC is put under the administrative control of the Defense Supply Agency

1965 Production of new catalog cards is discontinued as computers take over printing of cataloging and abstract data

1965 Microfiche replaces microfilm as the primary storage medium for DDC documents

1965 DDC begins managing the Work Unit Information System (WUIS) database

1966 All of DDC's regional offices are closed, except the one in Los Angeles, which remains open for another five months

1969 DDC begins working on a multilevel, secure Remote Online Retrieval System

1974 After two years of operational use, the DDC Remote Online Retrieval System is renamed the Defense RDT&E Online System (DROLS)

1975 A regional office in Los Angeles is reopened, followed one year later by an office in Boston

1975 DTIC establishes an Independent Research and Development (IR&D) database

1979 DDC is renamed the Defense Technical Information Center (DTIC)

1980 First Users Council established

1980 Nine Information Analysis Centers (IACs) are put under DTIC's control

1980	The unclassified portions of DROLS become accessible through direct dial and the TYMNET computer network service
1982	DTIC begins providing resource information for the Small Business Innovative Research (SBIR) Program
1983	DTIC assumes responsibility for the Manpower And Training Research Information System (MATRIS) database
1985	The Shared Bibliographic Input Network (SBIN) becomes operational
1986	The *Technical Reports Awareness Circular* (*TRAC*) replaces the *Technical Abstract Bulletin* (*TAB*)
1988	DTIC's Defense Gateway Information System (DGIS) computer network becomes operational
1988	An unclassified version of the *Technical Reports* (*TR*) database becomes available in Compact Disk-Read Only Memory (CD-ROM) format
1989	The *Technical Reports Awareness Circular* (*TRAC*) is discontinued
1990	The Scientific and Technical Information Library Automation System (STILAS) becomes available
1991	Administrative control of DTIC is transferred to the Office of the Secretary of Defense (OSD); DTIC-A is formed
1991	DTIC is put under the Defense Business Operating Funds (DBOF) program
1991	Secure Telephone Unit, third-generation (STU-III) service becomes operational, allowing users to access classified portions of DROLS through direct-dial modems
1994	DTIC's financial structure changed from DBOF back to an appropriation basis
1994	DTIC begins offering numerous Internet products, including GoldenGate, a STINET WAIS, and a World-Wide Web server
1995	First phase of the Electronic Document Management System (EDMS) becomes operational
1995	DTIC moves from Cameron Station to its new headquarters at Ft. Belvoir, Virginia

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DTIC Acknowledgments

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Produced by the Technical Information Division
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Defense Technical Information Center

65th Anniversary 1945-2010

About DTIC

Established in London in 1945 as the Air Documents Research Center (ADRC), the agency's first mission was to collect and catalog captured World War II scientific, technical and intelligence documents. Over the next 65 years the Defense Technical Information Center (DTIC), grew to become the central source within the Department of Defense (DoD) for acquiring, storing, retrieving and disseminating scientific, technical, research and engineering information. As technology has grown exponentially, so has the need for reliable and accurate information. The methods by which information is acquired, stored, accessed and disseminated has changed but for DTIC, now headquartered in Fort Belvoir, VA, the mission has remained fundamentally the same.

DTIC's Mission:
To provide essential, technical, research, development, testing and evaluation (RDT&E) information rapidly, accurately and reliably to support our DoD customers' needs.

Today DTIC is the gateway to Defense Scientific and Technical Information (STI), serving as a central repository of defense related scientific, technical, research and engineering information. DTIC acquires, organizes and disseminates this information to support the DoD science and technology (S&T) community which includes Unified Combatant Commands (COCOMs), DoD labs, defense acquisition community, industry, academia and Federally Funded Research and Development Centers (FFRDC). Leveraging the multi-billion dollar investment in DoD research and engineering, DTIC provides time-saving resources for locating and sharing DoD S&T information. This equates to a reduction in the duplication of efforts and redundant research, which in turn reduces the taxpayer burden and most importantly aids the DoD S&T community in delivering products more rapidly to the Warfighter.

Maintaining the balance between serving the public's need for open access to information and the DoD S&T community's need for controlled access to various classifications of information (public, limited, classified) is paramount. DTIC is a leader in DoD system security, utilizing the latest technologies to protect limited and controlled information while easing customer access by providing single-sign-on and Common Access Card (CAC) enabled Web sites. This is reflected in the fact that DTIC's Federal Information Security Management Act (FISMA) scores are regularly among the highest within the DoD.

DTIC continues to develop and improve its systems through the application of advanced, innovative processes and technologies in order to enhance delivery of DTIC products and resources to customers. Over the last two years DTIC has consolidated its resources into two public and limited access Web sites, DTIC Online and DTIC Online Access Controlled. Additionally, DTIC served as the lead component in a joint project between the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)); Director, Defense Research and Engineering (DDR&E); Rapid Reaction Technology Office (RRTO) and Assistant Secretary of Defense for Networks and Information Integration/DoD Chief Information Officer (NII/DoD CIO); the result was the DoD's first Science and Technology Wiki, DoDTechipedia, and the DoD's new ideas portal, DefenseSolutions.gov.

DTIC's core competencies are wide ranging and, as the agency has grown, so has its responsibilities. DTIC's document collection contains over 2.5 million documents, including Technical Reports (TR), Research Summaries (RS) and Independent Research and Development (IR&D), and it continues to acquire over 25,000 new reports each year. DTIC also manages 10 Information Analysis Centers (IACs) who conduct cutting-edge research and analysis to solve the most complex defense, scientific and engineering challenges.

In addition, DTIC hosts, develops and maintains more than 100 DoD and Federal government Web sites. DTIC also partners with the 10 COCOMs, providing direct support during major exercises and to the Warfighter in the field. As an information provider, DTIC also participates in the following programs; the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs; the DoD Scientific and Technical Information (STINFO) program, Historically Black Colleges and Universities/Minority Institutions (HBCU/MI) program; and the University Research Support Defense Experimental Program to Stimulate Competitive Research (URS/DEPSCoR) program.

Over the next 12 months (in the following pages), you will see how DTIC has evolved over the last 65 years. Products and services have changed as have delivery methods, the way DTIC interacts with its customers, the way documents are input into DTIC's collections and even the name of the agency. However, over the course of these 65 years, DTIC has remained committed to the task of providing the DoD community with a centralized knowledge base of defense related science, technical research and engineering information and ensuring that the information can be accessed by those who need it.

R. Paul Ryan
Administrator
'Mission First, People Always'

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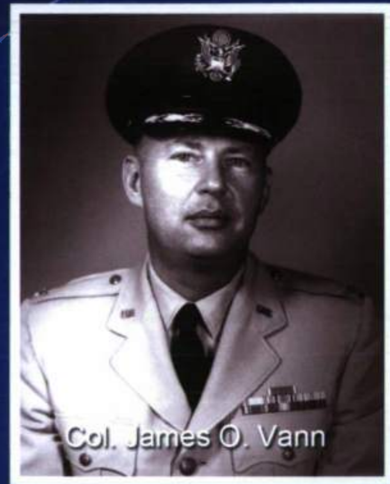
DTIC Administrators


Col. H.M. McCoy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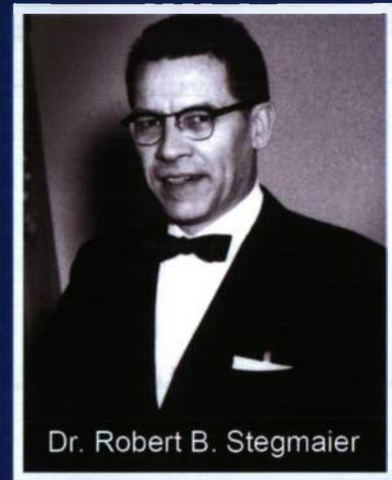
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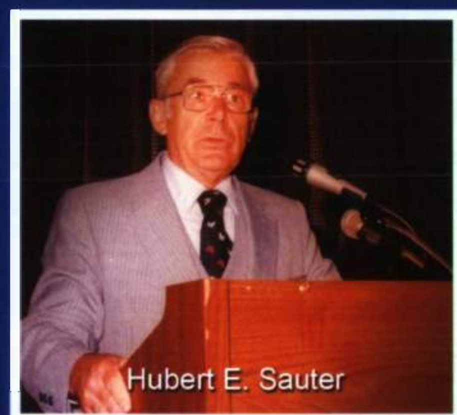
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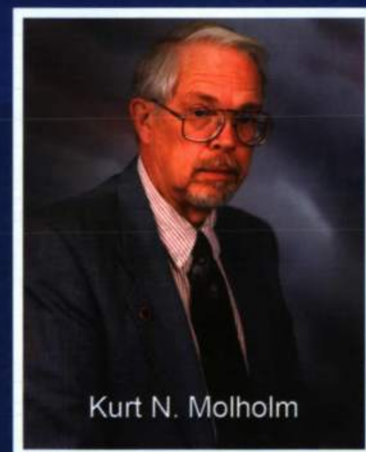

Kurt N. Molholm

THEN

DTIC's past administrators have been a mix of both Army and Air Force commissioned officers and civilians. The first DTIC administrator was Col. H.M. McCoy, who served from 1945 to 1948. Mr. Leslie Neville became the first civilian administrator, serving from 1951-1955.

R. Paul Ryan (DTIC)	2006 - Presen
Kurt N. Molholm (DTIC)	1985- 2006
Hubert E. Sauter (DDC/DTIC)	1973 - 1985
Robert B. Stegmaier, Jr. (DDC)	1963 - 1973
Col. James O. Vann (ASTIA/DDC)	1961 - 1963
Col. Woodrow W. Dunlop (ASTIA)	1957 – 1961
Col. Franklin K. Fagan(ASTIA)	1955 - 1957
Leslie Neville (CADO/ASTIA)	1951 - 1955
Col. A.A. Arnhym (CADO)	1948 - 1951
Col. H.M. McCoy (ADRC)	1945 - 1948

NOW

Mr. R. Paul Ryan, a member of the Senior Executive Service (SES), is the current DTIC administrator. Appointed in 2005, Mr. Ryan has served in a variety of positions at DTIC over the last 25 years, and has a long-standing history of improving the organization. Mr. Ryan helped change DTIC's paper-based workflow to an electronic environment. He also led the transition of DTIC from a subordinate organizational structure to an established DoD Field Activity within the Under Secretary of Defense for Acquisition, Technology and Logistics (AT&L), reporting to the Director of Defense Research & Engineering (DDR&E).


R. Paul Ryan

Awards and Recognition

Providing award-winning products and services is not a new concept at DTIC. Information and documents in DTIC's collections (even those dating back to the 1800s) have been used time and again to help with high-profile projects and challenges.

THEN

In 1997, Vice President Al Gore awarded the Vice President's Hammer Award to DTIC for its ability to make information available via the Internet, thereby contributing to "building a better government." In 1998 DTIC was recognized by the Federal Library and Information Center Committee (FLICC) as the 'Federal Library / Information Center of the Year' for its leading-edge use of technology and the Internet for information dissemination.

NOW

In 2005, DTIC won the Special Libraries Association's Innovations and Technology Award. In 2009, DoDTechipedia won a 22nd Annual Government Computer News Award for "Outstanding Information Technology Achievement in Government" and was featured as part of the White House's Open Government Initiative. These accolades and successes demonstrate DTIC's ability to contribute top-quality services to the DoD, Federal government and the Warfighter.

DTIC Annual Conference

DTIC has a long-standing reputation as a customer-based agency, and to continue its tradition of providing superior customer service, DTIC holds an annual conference to share information with customers and obtain their feedback about DTIC's offerings.

THEN

In 1973, DTIC, then the Defense Documentation Center (DDC), held its first Defense Research, Development, Test and Evaluation (RDT&E) Online System (DROLS) User Conference. This forum was the beginning of an annual event providing an opportunity for DTIC to network with its customers and exchange information.

NOW

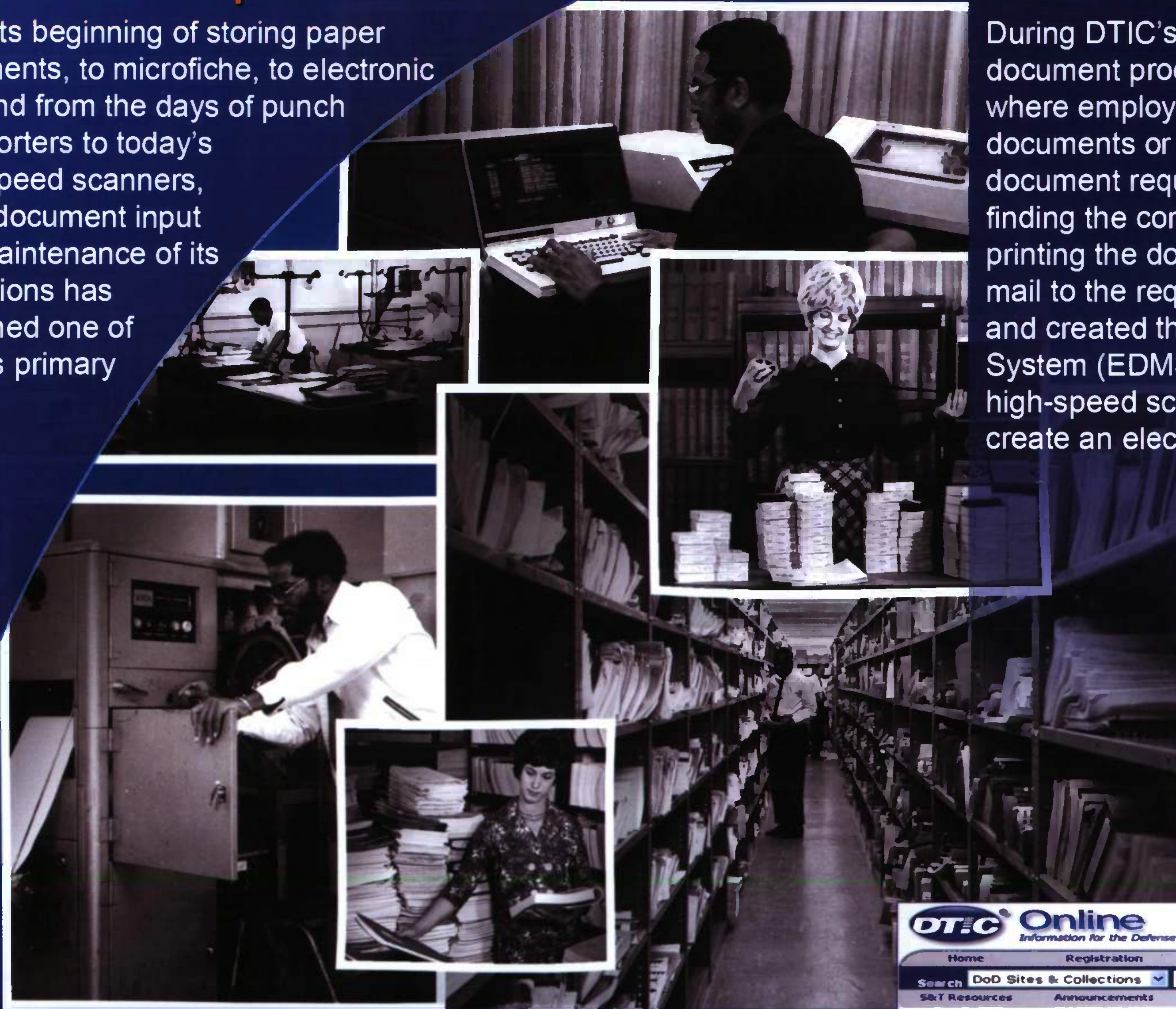
DTIC has hosted its Annual Conference every year since 1973, with the exception of 1976 and 2001. With continued growth, this conference now encompasses all of DTIC's products, services and resources. This year, on March 22-24, 2010, DTIC will once again hold its Annual Conference continuing the long-standing tradition of providing a forum whereby DTIC and its customers can exchange knowledge and information. This year's topics will include DTIC's Partnership with the Unified Combatant Commands, Controlled Unclassified Information (CUI), copyright, virtual worlds, collaborative tools, maximizing the use of DTIC resources and more.

Document Input and Collections

From its beginning of storing paper documents, to microfiche, to electronic files and from the days of punch card sorters to today's high-speed scanners, DTIC document input and maintenance of its collections has remained one of DTIC's primary goals.

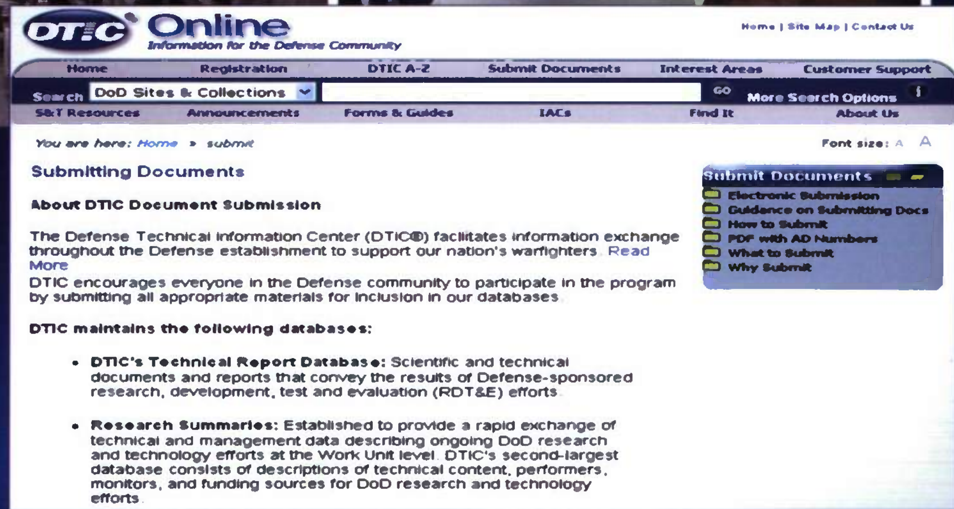
THEN

During DTIC's beginning at the end of World War II, document processing was a manual procedure, where employees read, filed and stored tons of paper documents or transferred documents to microfilm. A document request involved searching for the file, finding the corresponding hard copy or microfilm, printing the document, and delivering it by hand or mail to the requestor. By 1995, DTIC had evolved and created the Electronic Document Management System (EDMS) which functioned by using giant, high-speed scanners which would automatically create an electronic copy of the document.



NOW

In 2005, DTIC introduced optical character recognition (OCR) to scan handwritten, typewritten, or print text into machine-editable text. During that year, DTIC also began using a Digital Repro System to automatically digitize large quantities of microfilm. Today, the majority of documents are submitted electronically while paper documents are scanned and filed, so users are able to search for high-quality documents using DTIC's various online resources.



DTIC Online
Information for the Defense Community

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Submitting Documents

About DTIC Document Submission

The Defense Technical Information Center (DTIC®) facilitates information exchange throughout the Defense establishment to support our nation's warfighters. Read More

DTIC encourages everyone in the Defense community to participate in the program by submitting all appropriate materials for inclusion in our databases.

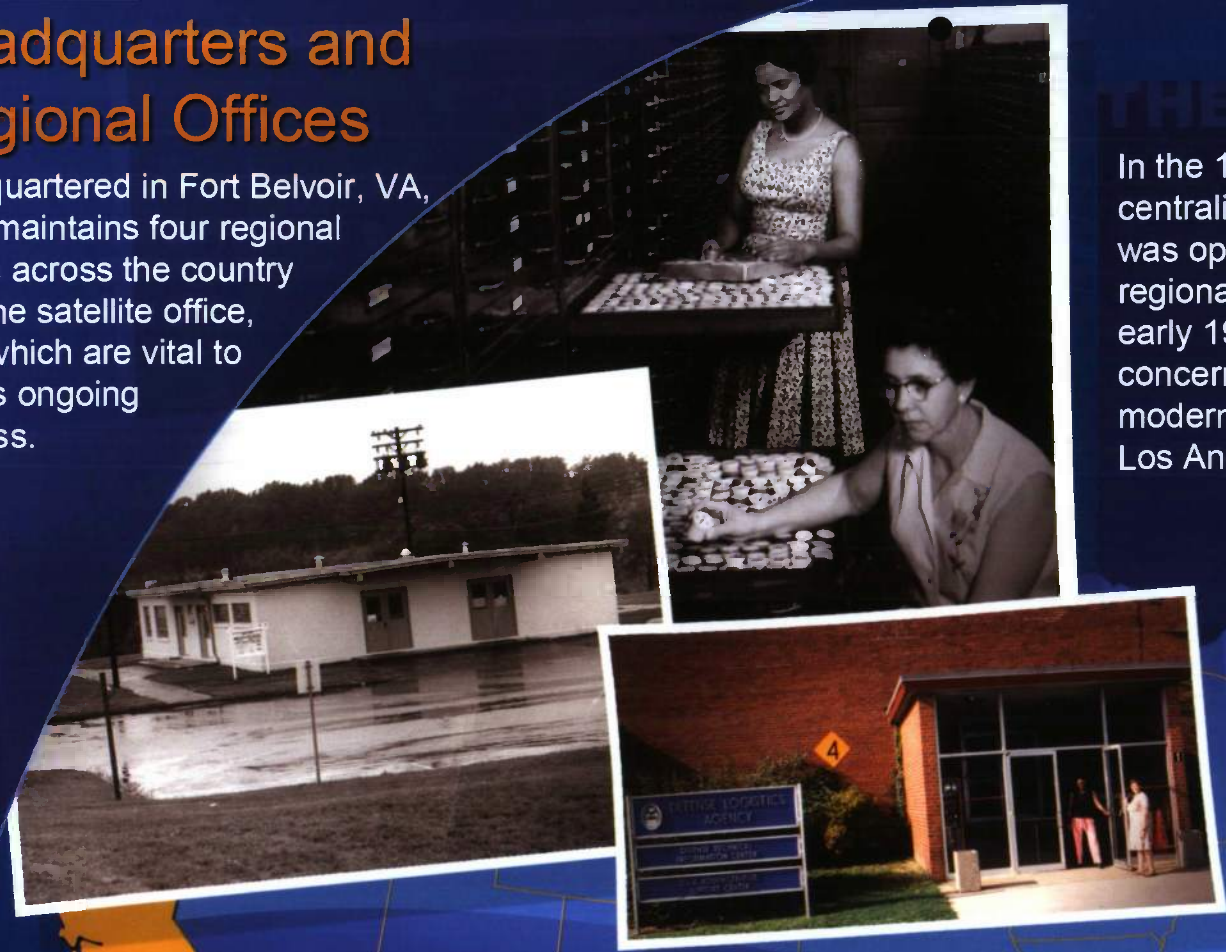
DTIC maintains the following databases:

- **DTIC's Technical Report Database:** Scientific and technical documents and reports that convey the results of Defense-sponsored research, development, test and evaluation (RDT&E) efforts.
- **Research Summaries:** Established to provide a rapid exchange of technical and management data describing ongoing DoD research and technology efforts at the Work Unit level. DTIC's second-largest database consists of descriptions of technical content, performers, monitors, and funding sources for DoD research and technology efforts.

Submit Documents
- Electronic Submission
- Guidance on Submitting Docs
- How to Submit
- PDF with AD Numbers
- What to Submit
- Why Submit

Headquarters and Regional Offices

Headquartered in Fort Belvoir, VA, DTIC maintains four regional offices across the country and one satellite office, all of which are vital to DTIC's ongoing success.



THEN

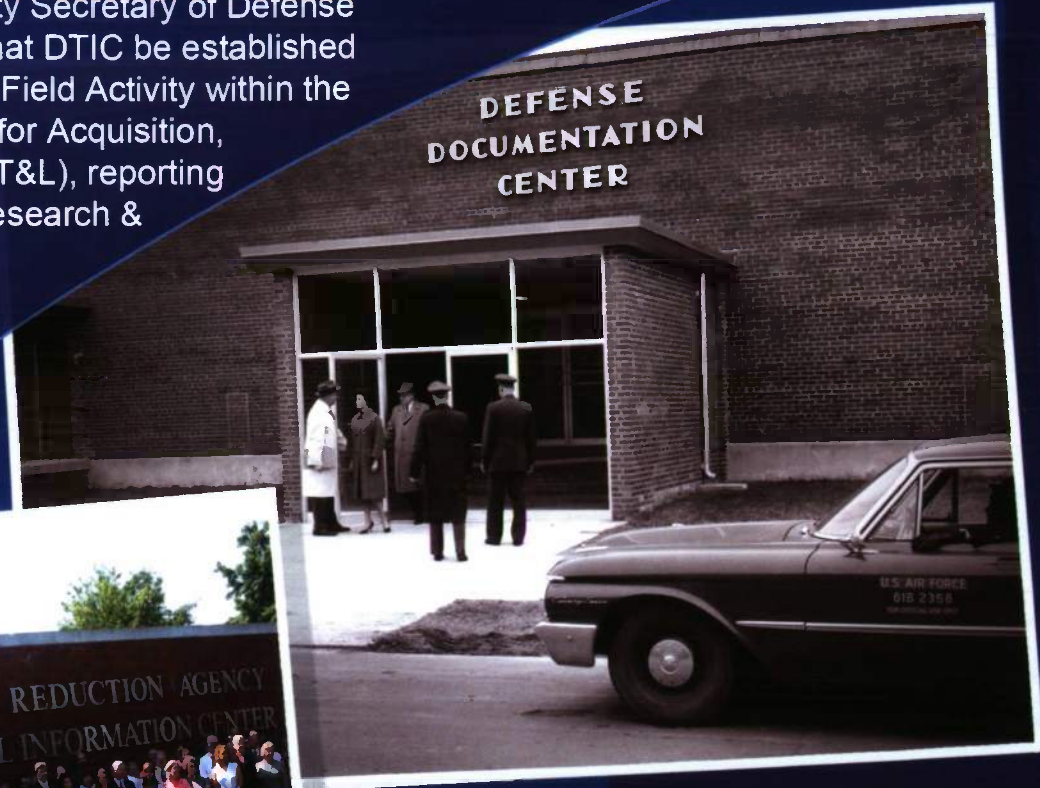
In the 1940s DTIC provided support from a centralized headquarters. The first regional office was opened in Los Angeles in 1950. Six more regional offices would eventually open; however, by early 1967 all would be closed due to security concerns and costs. DTIC re-established and modernized its regional offices and re-opened the Los Angeles office in 1975.

NOW

Today, with four regional offices located in Boston, MA, Dayton, OH, Albuquerque, NM, and Los Angeles, CA, DTIC is able to provide a range of products and services including reference and retrieval, registration services and assistance in accessing DTIC's various offerings within their region. DTIC also has a satellite office in San Diego, CA, which focuses on Human Systems and Biomedical Research and Development (R&D), and provides information support to small businesses. This office is part of DTIC's Component Information Support Directorate. DTIC's regional offices and satellite office are strategically located throughout the country to provide more effective support to DTIC's customers.

DTIC as a DoD Field Activity

On June 4, 2004, then Deputy Secretary of Defense Paul Wolfowitz announced that DTIC be established as a Department of Defense Field Activity within the Under Secretary of Defense for Acquisition, Technology and Logistics (AT&L), reporting to the Director of Defense Research & Engineering (DDR&E).



THEN

Over the past 65 years, DTIC has been known by other names; Air Documents Research Center (ADRC), Central Air Documents Office (CADO), Armed Services Technical Information Agency (ASTIA), Defense Documentation Center (DDC) and Defense Technical Information Center (DTIC) and has been aligned under various parent organizations.

"We knew that simply by being established as a field activity, the price of admission had gone up. We were going to be more visible, and we wanted that because we wanted our mission more widespread and better known."

-R. Paul Ryan, DTIC Administrator

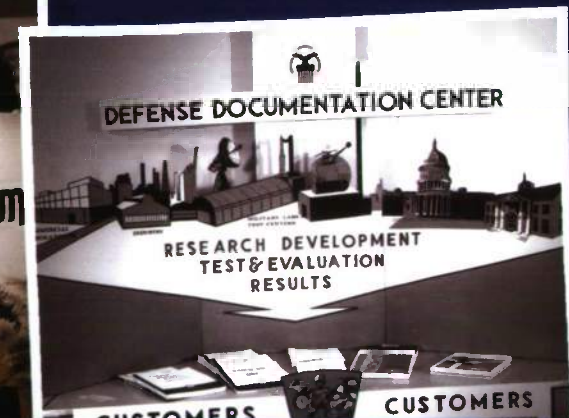
NOW

On June 8, 2005, DTIC's flag was raised in front of the McNamara Headquarters Complex in Fort Belvoir, VA. Since then DTIC has continued to expand and evolve its mission and functions. DTIC's move to a field activity will continue to enhance the use of S&T information databases by all DoD research and engineering activities.

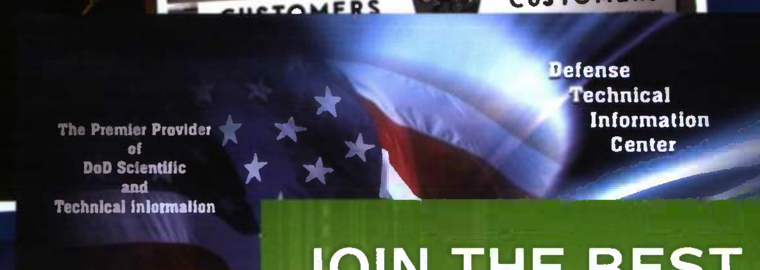
Keeping DTIC Customers Informed

Conducting outreach and communicating to current and potential customers about products and services has been a priority since DTIC's inception. DTIC customers include DoD (both civilian and uniformed personnel) other U.S. government agencies, defense contractors and federally-funded research and development centers. These constituencies are comprised of engineers, scientists, program managers, policy analysts, information professionals, the acquisition community, military students and more.

In the early days, DTIC would keep its customers informed by distributing flyers and brochures, setting up exhibit tables at conferences and distributing periodic newsletters and bulletins.



Today, DTIC utilizes more sophisticated media for dissemination and targeted marketing efforts to expand its customer base. Social media, Web 2.0 technologies, email campaigns, online advertising and conducting briefings via teleconference are some of the ways in which DTIC is utilizing today's technology to reach its customers. Traditional methods such as print advertisements and materials, conducting live presentations and exhibiting at some of the largest Defense tradeshows in the country are also used. DTIC has teams dedicated to providing registration support, customer reference services and conducting hands-on, customized training. All this is done in an effort to keep DTIC's current and potential customers aware of the latest technological resources available.

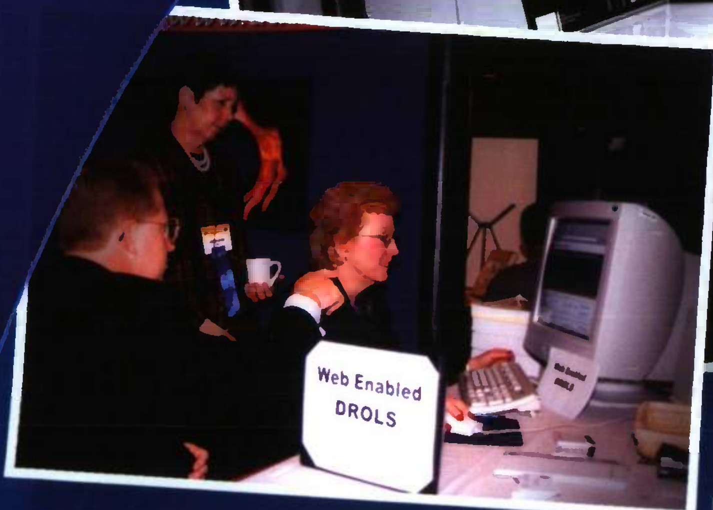


Online Resources

For almost 50 years, DTIC has been at the forefront of providing resources and products to customers utilizing online technology.

THEN

In the 1960s, using dial-up technology, the DDC Remote Online Retrieval System and then Defense RDT&E Online System (both known as DROLS), gave users direct online access to the DDC database. In 1993, DTIC started using the Internet for information storage and to provide external customer support. In 1994, DTIC helped the DoD launch its first Web site, DefenseLink.



"This tool (DoDTechipedia) enables DoD personnel to collaborate on technological solutions, reduce costs, add capability and avoid duplication. DoDTechipedia aids in the rapid development of technology and the discovery of innovative solutions to meet critical capability needs and gaps."

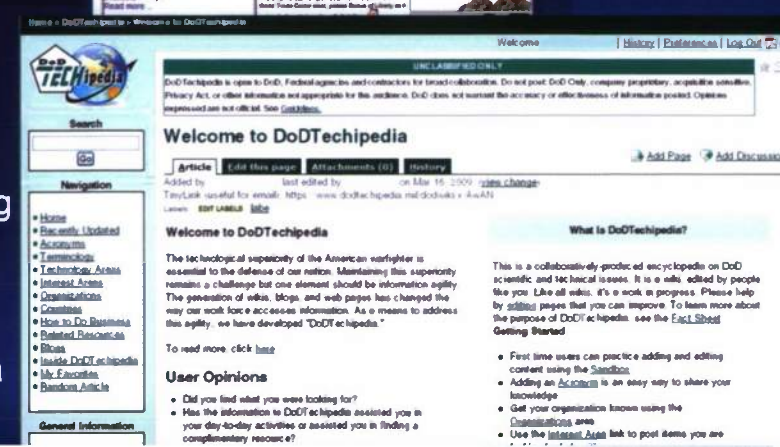
-Christopher Thomas, DTIC Chief Technology Officer

DTIC Online Access Controlled
Information for the Defense Community

DEFENSESOLUTIONS.GOV

NOW

DTIC's suites of services include DTIC Online (Public, Access Controlled, and SIPRNet) and DoDTechipedia (Limited, SIPRNet, and DefenseSolutions.gov). These sites provide DTIC customers with a wide range of products and resources, including: Technical Reports, Research Summaries, the Research and Engineering Database (programs of record submitted through the yearly E-Gov data call), Congressional budget information, and Defense S&T planning documents. The DoDTechipedia Suite of Services includes DoDTechipedia (DoD's first S&T wiki claiming over 10,000 users and 300,000 page views) and DefenseSolutions.gov (a portal to identify current and emerging technologies from industry).



Web Hosting

Since the inception of the World Wide Web, Web hosting has played an increasingly important role at DTIC. DTIC was the first agency to offer Web hosting to the DoD enterprise.

THEN

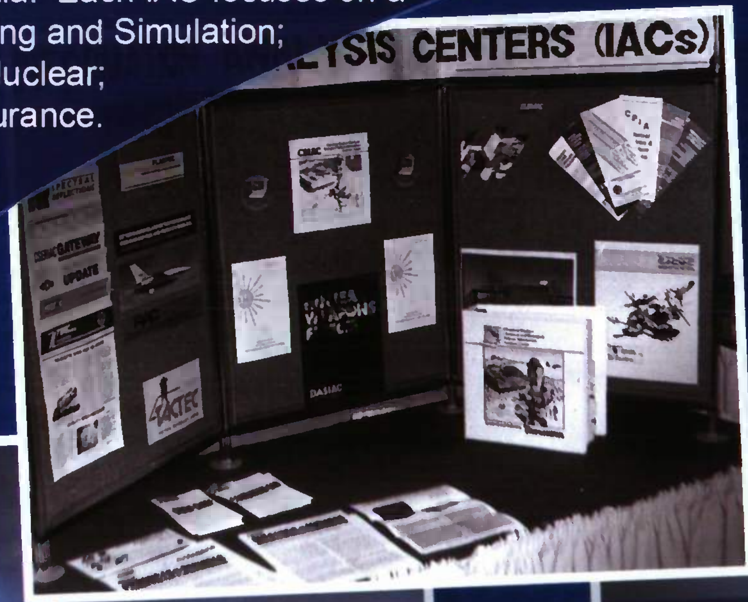
DTIC began offering Web hosting services to the DoD in 1994, including the first DoD site, DefenseLink, on November 10, 1994. Other important, collaborative sites DTIC hosted include GulfLINK, BosniaLINK, LabMan, AirForceLINK, JCSLINK, and DoD Environmental Cleanup.

NOW

DTIC hosts over 100 Web sites not only for the DoD, but also other Federal agencies such as the Federal Voting Assistance Program, Defense Contract Audit Agency, Defense Finance and Accounting Service, Defense Information Systems Agency, Defense Libraries, Freedom of Information Program as well as sites that help track funding and progress of anti-terrorism solutions and training. DTIC's hosting capabilities continue to grow.

Information Analysis Centers (IACs)

Since the late 1940s, the IAC program has helped create partnerships between the DoD, industry, and academia. Each IAC focuses on a specific technical area including; Modeling and Simulation; Chemical Biological, Radiological and Nuclear; Weapon Systems; and Information Assurance. The results of this research are used to populate the Total Electronic Migration System (TEMS) database which contains abstracts and full-text documents.



THEN

First organized in the late 1940s and early 1950s IACs perform technology assessments; synthesize and disseminate data; collect, maintain and develop models, simulations and other analytical tools; and provide information and advanced techniques to help researchers, engineers, scientists and program managers solve complex problems. In October of 1980, DTIC began administrative oversight of nine IACs.

NOW

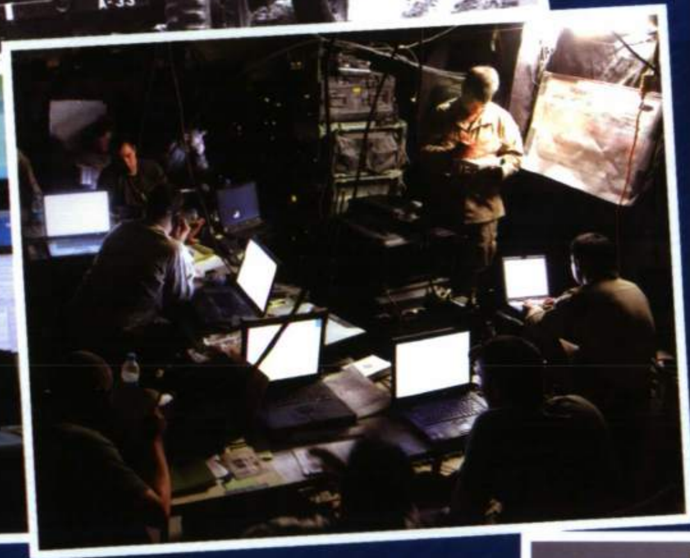
Today, DTIC functions as the DoD's executive agent for 10 IACs. Recently, IAC successes range from providing simulations, training and reliability and standards testing for the Air Force, Marines and Navy; to helping evaluate protective clothing for the military and first-responders; helping engineers with airplane safety; assessing rocket motors for space launch and missile defense; and increasing support and networking with the Unified Combatant Commands.

Combatant Command Support / Embedded Librarians

Over the past several years, DTIC has focused on partnering with the Unified Combatant Commands (COCOMs) to get information into the hands of the Warfighter more rapidly.

THEN

In 2007 DTIC launched a campaign aimed at establishing a working relationship with each of the 10 COCOMs. In November of that year, DTIC held its first COCOM Workshop to demonstrate how DTIC's products, services and resources can directly support COCOMs, specifically the S&T staff.



NOW

DTIC's ongoing partnerships with the COCOMs has led to the creation of a dedicated Operational Information Sharing (OIS) team that routinely visits and hosts the COCOMs to provide briefings and training on the latest DTIC products, services and resources. This also led to the creation of a new role at DTIC: Embedded Librarians. These information professionals work in a COCOM S&T cell during major exercises, where they provide immediate access to information and are complemented by additional reach back support at DTIC headquarters.

The Future of DTIC

Although its core mission has remained the same over the past 65 years, DTIC has transformed itself from an organization maintaining large amounts of physical documents to a contender in today's digital age where information is submitted, stored and retrieved electronically.

In DTIC's future, customers will be able to access multiple information resources both within the DoD and worldwide with a single system sign-on. They will be able to perform a unified search that simultaneously locates relevant data in all the appropriate resources regardless of the system's native format or environment. Taking advantage of new information technologies, DTIC will provide its user communities (S&T, R&D, acquisition, engineers, academia, etc.) with solutions rapidly, accurately and reliably. Information discovery, analysis and collaboration tools such as social media and those in Web 2.0 will keep DTIC at the forefront of the technology curve. New and improved online search engines, knowledge-sharing tools and virtual communities will keep DTIC current and relevant to counter threats of the 21st century warfare and provide the best support to the Warfighter.

No matter what the medium, content, or dissemination method, DTIC's purpose has always been to help people use information as efficiently as possible to strengthen the nation's defense and achieve technical superiority on any battlefield. DTIC is proud to celebrate 65 years of serving the DoD community and our nation. Through technology, DTIC has evolved in how it delivers its products, services and resources to its customers and will continue to do so for the next 65 years and beyond!

"The end product of all Department of Defense sponsored research and development -- i.e., the recorded conclusions -- costing vast sums of money and irreplaceable scientific effort, must be assembled, organized, preserved, and made available for future reference by those concerned with exploring and guarding the scientific frontiers of the Nation."

-George C. Marshall, Former Secretary of Defense

1 June 1945 Air Documents Research Center / Air Documents Division (ADRC/ADD) established

13 October 1948 ADRC/ADD is renamed Combined Arms Documents Office (CADO)

1 January 1952 Armed Services Technical Information Agency (ASTIA) takes over operations of CADO

3 February 1958 ASTIA moves to Arlington, VA

19 March 1963 ASTIA is reconstituted as Defense Documentation Center (DDC)

8 July 1963 DDC moves to Alexandria, VA

20 May 1969 Defense RDT&E Online System (DROLS) goes online

15 October 1979 DDC becomes Defense Technical Information Center (DTIC)

12 October 1980 Information Analysis Centers (IACs) are placed under administrative control of DTIC

November 1994 – Scientific and Technical Information Network (STINET) goes online

18 September 1995 DTIC moves to Fort Belvoir, VA.

25 March 2003 Private STINET goes online

4 June 2004 DTIC becomes a DoD Field Activity

20 September 2004 Classified STINET goes online on SIPRNET

4 May 2005 Research & Engineering (R&E) Portal is launched

28 July 2008 DTIC Online Public is launched

6 October 2008 DoDTechipedia is launched

6 February 2009 DefenseSolutions.gov is launched

21 September 2009 DTIC Online Access Controlled is launched

DEFENSE TECHNICAL INFORMATION CENTER
U.S. DEPARTMENT OF DEFENSE

www.dtic.mil