AD-A195 013 THE SMALL COMPUTER AND ITS IMPACT ON THE FIELD GRADE OFFICER(U) AIR COMMAND AND STAFF COLL MAXWELL AFB AL S B HENTE APR 88 ACSC-88-1195 1/1

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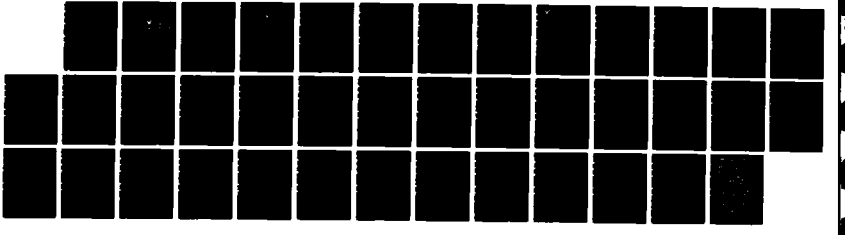

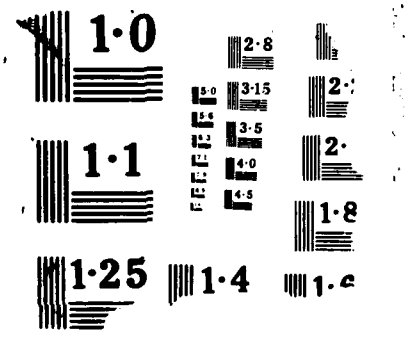
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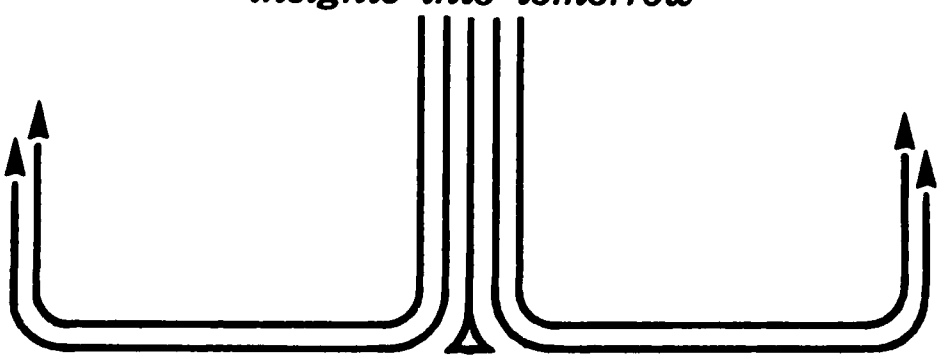
AIR COMMAND AND STAFF COLLEGE

STUDENT REPORT

THE SMALL COMPUTER AND ITS IMPACT ON THE FIELD GRADE OFFICER

MAJOR SCOTT B. HENTE 88-1195

"insights into tomorrow"



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REPORT NUMBER 88-1195

TITLE THE SMALL COMPUTER AND ITS IMPACT ON THE FIELD GRADE OFFICER

AUTHOR(S) MAJOR SCOTT B. HENTE, USAF

FACULTY ADVISOR MAJOR MICHAEL E. HUFFINE, USAF
ACSC

SPONSOR MAJOR JAMES D. GATEWOOD, USAF
ACSC

Submitted to the faculty in partial fulfillment of requirements for graduation.

AIR COMMAND AND STAFF COLLEGE
AIR UNIVERSITY
MAXWELL AFB, AL 36112

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT STATEMENT "A" Approved for public release; Distribution is unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) 88-1195	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION ACSC/EDC 6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code) Maxwell AFB, Alabama 36112-5542	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING/SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO / WORK UNIT ACCESSION NO.

11. TITLE (Include Security Classification)

The Small Computer and its Impact on the Field Grade Officer

12. PERSONAL AUTHOR(S)
Hente, Scott B., Major, USAF

13a. TYPE OF REPORT	13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
		1988 April	36

16. SUPPLEMENTARY NOTATION

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This report summarizes the evolution of the small computer in the Air Force workplace. It discusses the move to a standardized hardware/software system and the benefits it entails. It further emphasizes the many uses of the small computer within the military environment and compares the use with that already being performed in the civilian setting. In addition, there is a discussion of the impact of the small computer on the field grade officer and its ability to help him in his day-to-day work. Lastly, there is an analysis of the education and training necessary in order to effectively utilize this new machine and a position is put forth that ACSC is an excellent forum for conducting this learning.

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☐ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	UNCLASSIFIED

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b. TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
ACSC/EDC Maxwell AFB, AL 36112-5542	(205) 293-2867	

PREFACE

The recent proliferation of small computers has brought about a revolution in the Air Force workplace. Having the capability to dramatically alter the way the Air Force approaches its daily operations, the small computer carries with it the potential to increase efficiency and improve the overall process of providing timely information to commanders at all levels. While the early use of the small computer by the Air Force was, in retrospect, a struggle to standardize and fully utilize this powerful tool, the Service has come a long way in utilizing the many benefits of these machines.

This research project will trace the recent history of the Air Force use of the small computer and what this new piece of office technology can do. Because private industry has, in many ways, been the leading proponent and user of these new systems, an examination will be conducted of the use of small computers within civilian industry. Possible parallels between the private sector and the military will be evaluated to "piggy-back" on the innovations already pioneered. In addition, we will look at the many unique applications the small computer has for the military. Realizing that the field grade officer stands at a critical division between senior Air Force leadership and the rest of the Service, we will pay particular attention to the applicability of the mid-career officer understanding and using the small computer. Finally, a look will be given to suitable small computer education for the field grade officer, to increase his ability to share, process and transfer information critical to the conduct of the U.S. Air Force. Specifically, Air Command and Staff College will be proposed as an excellent source for this needed education.

Recent technological innovations have changed the concept of what exactly a small computer is. Micro, mini and single user are all prefixes that have changed in the last few years, as well as their meaning to the computer industry. The intent of this paper is to maintain a non-technological bearing and concentrate on the use, applicability, and significance of these machines and how they relate to the Air Force in general, and field grade officers in particular. For the sake of this paper, a small computer will be considered to be a machine that incorporates the technology of electronic miniaturization, has the capability to unilaterally store and process information, and is of such a size it can reasonably fit on a desk top.

ABOUT THE AUTHOR

Major Scott Hente has numerous accomplishments in both the rated world and in the area of small computers. As a Senior Navigator with 4000 flying hours, Major Hente has served as an Instructor and/or Evaluator Navigator in the KC-135, EC-135, RC-135 and E-4 aircraft. The top graduate in bcth his Undergraduate Navigator Training Class and Combat Crew Training Class (Strategic Air Command), Major Hente was one of only two Strategic Air Command nominees for the prestigious 1984 Institute of Navigation Norman P. Hayes Award. In the field of computers, Major Hente has marks of similar distinction. He is a 1975 graduate of the Air Force Academy with a B.S. in Computer Science and holds an M.S. (1982), also in Computer Science, from the University of Nebraska. While assigned to a flying unit at Offutt AFB, Ne., Major Hente was a major participant in the formation of procedures and techniques involved in the use of small computers at the squadron level. While assigned to HQ, Air Force Space Command, Major Hente served as a Program Manager for several large scale computer acquisitions involving the timely processing and notification of potential hostile missile attacks. In addition, he served as the Executive Officer for the Air Force Space Command Deputy Chief of Staff for Systems Integration, Logistics and Support.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

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REPORT NUMBER 88-1195

AUTHOR(S) MAJOR SCOTT B. HENTE, USAF

TITLE THE SMALL COMPUTER AND ITS IMPACT ON THE FIELD GRADE OFFICER

I. Purpose:. To explore the development of the small computer within the Air Force workplace and examine the needs of the field grade officer in understanding and using small computers on a day-to-day basis. In addition, ascertain the usefulness of computer education at the Air Command and Staff College.

II. Problem: The recent proliferation of small computers has brought about a revolution in the Air Force workplace. Having the capability to dramatically alter the way the Air Force approaches its business and daily operations, the small computer carries with it the potential to increase efficiency and improve the overall process of providing timely information to commanders at all levels. There is a hindrance to this new technology: a lack of knowledge by a great many individuals, particularly field grade officers, on the use and applicability of these machines.

III. Data: In the early years of the small computer explosion, the Air Force (along with private industry) struggled to move in a single coherent direction with respect to this new tool of office automation. Varying degrees of acceptance were found throughout the Air Force as different individuals sought to use these machines to assist them in their everyday work. The Air Force finally settled

on a series of standardized small computers to solve the problems of compatibility and ease the transition as members moved from one assignment to another. Implicit in these acquisitions was the assumption the small computers would be effectively used. While this concept was not universally attained, enough interest was generated within individual units to make productive use of the computers. At the same time, private industry was starting to realize the potential of the computer and to utilize it in ever increasing roles. This utilization by the private sector began to force the computer industry to produce machines and software programs more responsive to the business world. Many of these programs have a use within the Air Force without any alteration. Indeed, many parallels can be drawn in the use of small computers within private industry and the Air Force. Not the least of these similarities is the perceived need for adequate computer education of employees to increase the overall effectiveness and use of the small computer.

IV. Conclusions: The field grade officer stands at the critical division between senior Air Force leadership and the rest of the commissioned and noncommissioned officer corps. His potential to participate in the sharing, processing and transfer of information is tremendous. His knowledge of computer systems can have a positive impact on getting the correct information to a commander in a timely manner. In addition, just as many civilian managers are moving to actually use a small computer for their own day-to-day business affairs, more field grade officers are seeing the potential of the small computer and its ability to assist them in their individual staff functions.

V. Recommendations: The Air Force must increase the overall knowledge base of its members to the use and applications of the small computer. Critical to this is the education of the field grade officer. With the programs already in place that are designed to assist the officer in his everyday working environment and the many innovations that will be upon us in the very near future, it is imperative this training be carried out in an expeditious and efficient manner. A logical place to begin is the Professional Military Education offered at the Air Command and Staff College. Given that the school is designed to improve the staff capabilities of field grade officers, it only seems right that staff training incorporate the newest addition to the military office, the small computer.

Chapter One

WHAT WE HAVE AND HOW WE GOT IT
(THE EVOLUTION OF SMALL COMPUTERS IN THE AIR FORCE)

THE EARLY YEARS - PRE 1983

The jaws of darkness do devour it up:
So quick bright things come to confusion. (5:388)

In the late 1970s and early 1980s, the growing world of the small computer was beginning to have an effect on the way the Air Force conducted its business. From having a ready format for completing OERs, to automating mission planning, more and more individuals began to use the small computer to make their jobs easier. There was, however, no consistency in the procurement, application, or management of these new resources. As late as 1982, there were complaints that the usage of small computers was not standardized. (33:20) The Tactical Air Command had a superb plan for the use of 1500 small computers (predominantly a mission planning system) but there was no sharing of that acquisition with the other MAJCOMs. (34:7) I witnessed the Strategic Air Command go through a process of putting "Celestial Training Devices" (somewhat limited small computers) at its flying units. Although designed to assist in navigation training, they were usurped by dozens of "computer hackers" wanting to write and try out some of their own pieces of software.

There was an eagerness to use these new tools but no real thought given to an overall plan of standardization. What with individuals bringing in personal small computers from home, limited (and often different) acquisitions by MAJCOMs, and all sorts of software (personal, public domain, pirated) being used, there was a great deal of confusion. It is no wonder that in his 1982 ACSC Research Project, Major H. Wayne Wolfe wrote: "Many contemporary military leaders suggest that proliferation and misuse of computer systems are root causes of the perceived decline in Air Force leadership." (35:2)

There had to be some very definitive reasons why people were so interested in using these new automated tools. Of prime importance was that they assisted the individual in accomplishing his tasks in a more efficient manner. I personally witnessed the time needed to perform ordinary office correspondence decline

considerably with the advent of word processing. In addition, many flight crews were spending more time discussing and going over an upcoming flight during mission planning rather than "number crunching" the mundane arithmetic of flight plans, weight and balance sheets, and fuel computations. Clearly, determined Air Force personnel were set on using small computers to improve their efficiency even at a time when the Air Force was not establishing standards in their acquisition, usage, or overall management.

The Air Force was in a maddening sea of non-standard systems that did not coexist with one another. But this was not entirely the fault of the Service. Private industry was itself thrashing around trying to find an accepted (and most importantly, standardized) way of building and operating small computers. The late 1970s were a heyday for the fast starting computer company. Many new computer firms were started to meet a growing demand for both hardware and software. Several larger and more established firms joined in the mess but none of them provided any real leadership. The first "accepted" new company was Apple, and with its meteoric rise from a hobbyshop in a garage to an established large computer firm, it provided a role model for much of the industry in innovation and independence. (19:92) Shortly after this, many other computer firms sprang up quickly and struck out on "their" approach. Unfortunately, this led to the situation alluded to above: no conformity or standards. Computer diskettes from one machine could not be used by another, operating systems were incompatible, software designed for one machine had to be drastically altered to run on another, and people had to go through a whole new learning process when they changed computers. Small wonder some Air Force personnel would bring their small computer from home into the office; it was easier than learning a new system, and they could take their work home with them.

Three "standards" more or less established themselves during this period: Apple, Radio Shack (with its Tandy line of computers) and a group of computer systems that adopted the Control Program for Microprocessors (CP/M) operating system. Even though the Air Force procured a lot of its initial machines from this last group of CP/M machines, there were still problems with diskette compatibility and standardized software.

In the second half of 1981 this disarray within the computer industry was met head on by the computer giant: International Business Machines (IBM). With it's introduction of the IBM PC, not to mention IBM's technological reputation and huge marketing system, a new standard was formed. The IBM, with its many improvements, remains the industry standard today. Only one other company, Apple, can successfully market on a grand scale with a hardware/software setup significantly different from IBM.

At the same time the computer industry was starting to standardize, the Air Force also began to take steps in this direction. In 1981, a National Academy of Engineers study pointed out the need to standardize all aspects of small computers within the Air Force. In 1982 the Air Force Small Computer Office Automation Service Organization (AFSCOASO) was formed at Gunter AFS, Al. to assist in the establishment of Air Force standards.(38) Also in 1982, the Air Force and the Navy decided they could solve a common problem and seek a standard system they both could buy. (24:64) The Air Force was finally on its way to obtaining a standardized small computer system.

THE WORLD OF STANDARDIZED AIR FORCE COMPUTERS

> And thine ears shall hear a word behind thee, saying, This is the way, walk ye in it, when ye turn to the right hand, and when ye turn to the left.
>
> (2:Isaiah 30:21)

The rationale for standardized small computer acquisitions

As discussed earlier, there was a need within the Air Force to use small computers, but just as important, there was a need to standardize their usage. Air Force personnel were starting to produce some quality pieces of software but often could not share these with other organizations due to the incompatibility of different machines at different locations. In addition, the haphazard way of procuring systems had not made for the most economical process of acquiring small computers. Quite often computers were bought in lots of one or two, with some pieces of software included, and I personally observed that in their eagerness to get some sort of system "on-line", many organizations did not worry about cost effective acquisitions.

During this time, the Air Force bureaucracy was not exactly helpful in the acquisition process. DARs (Data Automation Requirements), mini-DARs, DPDs (Data Program Directives) and a host of other "paper trails" were needed to procure a small computer system. Primarily designed for the acquisition and management of large mainframe computer systems, these procedural items were ineffective in procuring small computers. (34:5) Faced with a bewildering set of procedures to purchase a small computer, I can personally attest to the fact that many organizations gave up or looked for other innovative (i.e. illegal) ways to proceed with the acquisition. This only made the standardization process worse.

A short history of standardized small computer acquisitions

The Navy and Air Force decided to proceed on a coordinated process to procure a standardized small computer and the Air Force Computer Acquisition Center (AFCAC), located at Hanscom AFB, Mass., was designated the contracting office for the AFSCOASO. (30:37) In early 1983, AFCAC began work on procuring a standardized small computer. There was a great deal of interest within private industry for this contract, what with the initial purchase to be 10,000 systems. (24:64) A total of 32 different companies submitted proposals which "was the largest number of proposals ever received for a single project in AFCAC history." (30:60) On 3 Oct 83, AFCAC awarded the contract to Zenith Data Systems for $29.3 million. (31:17)

Originally designed for a three year life span, the contract called for 10,000 units to be delivered. However, the initial purchase (the Zenith Z-120) proved to be so popular the 10,000 units were ordered in the first 10 months of the contract! (24:64) Adjustments were made to the contract to allow for additional units, but the demand was greater than anyone would have imagined; by the the time the contract met an early expiration in late 1985, 32,298 Z-120s were delivered to the Air Force alone! (38) In addition to buying a very popular machine, the Air Force streamlined the procurement process. By having a standard system in place, it became easier and less bureaucratic to order from the existing standard contract. To further enhance the popularity of the Z-120, Zenith made it available to government employees at prices similar to the low discount it was offering the Navy and Air Force. Now, not only did Air Force members have a common system, they could have the same one at home, further enhancing the popularity of the unit. (24:65)

In order to meet a growing demand for classified small computer usage, the Air Force and Navy in Oct 1984 awarded a contract to Zenith for a TEMPEST certified system, the Z-150. Later replaced with the Z-200, this small computer allowed small computer functions to be conducted that conformed to the National Standard (NACSIM) 5100A limitations pertaining to classified operating procedures. (24:65)

To meet the growing demand for small computer systems as well as keep pace with the advances in technology, a follow-on contract was awarded to Zenith for their Z-248 small computer system in February of 1986. It allows for up to 90,000 systems to be delivered to the Air Force over a three year period and as of October 1987, 45,000 systems had been installed. It should be noted all of these Zenith computers have varying degree of commonality among themselves, thereby adding to their overall utility. (38)

In September 1987, Zenith won another contract; this time for a lap-held small computer: the Z-184. It is estimated that 90,000 of these systems will be delivered over the next three years. In addition, the Air Force multi-user contract is proceeding on a pace that should allow contract award by mid-1988. This procurement will buy up to 22,000 mini-computer systems that could revolutionize the Air Force office environment. Up to 64 users (employing a small computer already in place or a "dumb" terminal) will be linked together in order to electronically conduct all aspects of staff work to include filing, coordination, and status checking of packages. (38)

A brief description of the standardized small computers in the Air Force

As discussed in the preceeding paragraphs, the three main standardized small computers purchased by the the Air Force are all products of Zenith Data Systems: the Z-120, Z-150/200 and Z-248. In May of 1985 the Navy contracted for a small portable computer: the Televideo XL. These have been acquired by the Air Force in very minute amounts (less than 500) and because of their relative rarity in our workplace I will confine this discussion to the Zenith products. (38)

As already mentioned, over 32,000 Z-120s were installed in the Air Force. A very popular machine, it combined both the 8-bit microprocessor system of the late 1970s along with the upcoming 16-bit microprocessor technology. (27:203) It could use either the old CP/M operating system, along with the multitude of software products designed for it, or the emerging 16-bit operating system with its growing list of software. The system could be upgraded with additional memory, both internal and with a hard disk, and with different output devices, particularly printers and plotters. Zenith also sold a great deal of popular software products licensed to it by the individual software producing companies. These included word processing, spreadsheet, and database management systems. Also available were specific computer languages such as BASIC, COBOL, FORTRAN and PASCAL. (24:65)

The Z-150 and then the Z-200 were machines developed along the lines of the IBM PC. (27:203) Because IBM was establishing itself as the industry leader, more and more software was being written and produced for it. Along with meeting TEMPEST certification, the Z-150/200 was compatible with the IBM and could use the many pieces of software designed for it. As with the Z-120, the Z-150/200 could be purchased with additional memory, different output devices and a host of popular software.

The Z-248 is a desktop unit compatible with the IBM PC AT (IBM's tops in the PC line). A superb small computer, the Z-248 is one of the top AT compatibles on the market and even outperforms the IBM. (27:205) As with the other units, it can be upgraded, comes with even more output devices and runs virtually any software designed for the IBM. Once again, Zenith is offering this system to government employees at a price close to that which the government is paying and considerably less than its normal retail markup. This system is proving to be the most popular machine yet purchased by the military, and a unit may be acquired by any organization within the entire DoD.

The most recent Zenith small computer to be purchased by the Air Force is the Z-184. Already popular with the Internal Revenue Service, Zenith's laptop is another system based on the IBM technology. Designed to run on either normal AC current or batteries, the Z-184 will allow for a flexibility hereto unheard of within the Air Force. Because of its compatibility with the Z-248, it can share data and information with this office system. As with the other units, additional upgrades and software can be purchased to accomodate many different users. (38)

The new age of small computer technology has certainly dawned upon the U.S. Air Force. For such a concerted effort to acquire these systems to take place, a great deal of need must be present within the military. This need manifested itself as the new technology was becoming available, but it has risen astronomically as new advances in the small computer field make themselves known. The next chapter will examine this need and take a look at the many uses for which the small computer is being used. Additionally, I will attempt to probe the question of whether the Air Force has enough qualified people to warrant the great number of systems being acquired.

Chapter Two

WE'RE GETTIN' 'EM BUT WILL WE USE 'EM? (AN ANALYSIS OF THE NEED FOR SMALL COMPUTERS AND ASSUMPTIONS FOR THEIR OVERALL USE)

WAS THERE, AND IS THERE, A NEED FOR SMALL COMPUTERS?

> It was the most that Ettie could obtain, and yet it was something. There was this distant light to illuminate the gloom of the immediate future. (4:848)

As the Air Force has grown, so has the explosion been felt in the office environment in general, and paperwork in particular. Prior to the widespread use of the small computer, mundane and repetitive tasks were consuming a great deal of the average staff officer's time. My own experience included seeing OERs that took many revisions before they were "ready for signature" (and then you had to hope the colonel/general didn't want to change a word!). Graphics were either clumsily drawn sketches or products that took days or weeks to get out of audio/visual support. Flight planning was often a series of simple repetitive arithmetic operations, prone to errors with possibly dangerous repercussions, that left little time for discussing emergencies or other aspects of the upcoming mission. Clearly, there was a definite need to try and automate this office work so as to free up the time of our officers and make them more productive.

The Air Force Systems Command Electronic Systems Division (ESD) found in a study "that one half of all work at a major organization is clerical, and further that one half of all clerical work is done by professionals." (16:49) It was these clerical functions that our professional, the field grade officer, found himself involved in. Typing, file maintenance and inter-office distribution are examples of this clerical work, and they are all activities that could be significantly improved with the use of automation. Interestingly, this same ESD study found automation could account for 30-60% reductions in the amount of time involved with these functions. (16:49)

This desire to improve the efficiency of the office workplace led to the haphazard procurements and then the standard systems acquisition described in Chapter One. Now that we are being propelled into the computer age, new uses for the machines are

being devised and overall productivity is increasing. Recent government publications highlight some of these new uses and point out that these new applications have "opened a floodgate of new ideas for enhancing the way we do our work." (22:15)

The Armed Forces certainly feels there is a future in the use of small computers as is witnessed by the requirement for Air Force Academy cadets and Naval Academy midshipmen to obtain small computers. (21:299 and 17:10) Both the Air Force and Navy are demanding these future officers buy Zenith Z-248s, thereby ensuring their compatibility with the thousands of systems being procured for the Services at large.

Small computers are finding a very substantial niche within the DoD. In addition to many administrative functions, the small computer is proving itself a real workhorse in the area of training. With the multitude of educational programs in the Air Force and the ever increasing attitude of producing maximum training with minimum resources, the computer is an ideal tool to incorporate into the classroom. Jim Martin, writing in the January 1984 edition of Defense Science and Electronics, stated: "Computers are beginning to assume a central role in education, and much of what we have seen in civilian schools should prove equally applicable to the military." (18:31)

Small computers are indeed coming into their own in the military workplace. Education, clerical, and flight planning are just some of the fields in which Air Force staff officers are starting to see big improvements. But who's using these powerful new tools and how proficient are they in their operation?

DOES THE AIR FORCE HAVE THE QUALITY OF PEOPLE TO USE SMALL COMPUTERS?

> You and your generation have displayed a commendable enthusiasm for change and rapid solution to the problems that beset our nation and our society. Expanding technology and population have certainly generated problems that do demand early resolution. (37:4-5)

The small computer is representative of a significant leap in technology that has occurred in the last decade. This leap, however, has not likened the use of the computer to something as simple as the operation of the telephone. While a PhD in Computer Science is not required to efficiently use a small computer, a certain amount of training is required for the particular hardware and software being employed. The vast proliferation of small computers in our society has made us more aware of the capabilities they possess and has tended to promote

a sense of curiosity and a desire to learn how to operate them. (32:14-166) Curiosity alone, however, will not make us all computer experts overnight. Some specific training and education has to accompany the computer purchase.

None of the research that I performed for this project suggested the Air Force had any preconceived notions or made any assumptions about the level of computer literacy inherent within the officer or NCO corps prior to purchasing small computers. All that was obvious was that people "out there" were starting to use these new tools and there was a loud cry for more hardware and software. Obviously, some training in the use of these small computers can pay big dividends. Computer literate personnel, in the words of Henry Fersko-Weiss, "teach themselves new programs and learn new computer techniques...They are the ones who get the maximum benefit out of personal computing and consequently produce the most measurable results." (13:96) However, a little bit of knowledge can be a dangerous thing. Major H. Wayne Wolfe, writing in his 1982 ACSC Research Project, noted a great many computer systems did not achieve the performance level desired when they were originally purchased. One of the reasons he attributes this to is "untrained or inexperienced system users or developers". (35:5-6)

The first small computers used within the Air Force were predominantly employed by people who had some sort of background or interest in computers. I personally witnessed small computers go to units where nobody was interested in them and they sat unused most of the day. On the other hand, I was in an organization where we had several individuals interested in programming and developing applications for the squadron to use. Consequently, we always had a waiting line to use the computer and the unit saw an improvement in its overall efficiency.

The age of small computers and their tremendous ability is upon us. Officers and NCOs alike are using them to achieve some impressive results. (22:15) The Air Force has to be in a position to effectively utilize these machines by even more of its personnel. In this way we will be "fully understanding the power of personal computing and a more thoughtful execution of its application." (13:101) It is important, then, to see how others are beginning to incorporate small computers into their daily work environment. Specifically, I will look at the civilian workplace and see what lessons can be learned from private industry in the use and applications of small computers. In addition, I will examine the different ways in which training in the use of these systems is conducted in the private business arena. Lastly, it is imperative a look be given to any potential parallels between the civilian world and the military with regard to the use of small computers.

Chapter Three

WHAT'S THE REST OF THE WORLD DOING?
(A LOOK AT PRIVATE INDUSTRY'S USE OF SMALL COMPUTERS)

THE GOALS OF PRIVATE INDUSTRY VIS-A-VIS SMALL COMPUTERS

> Thy letters have transported me beyond This ignorant present, and I feel now The future in an instant. (6:1031)

Between 1900 and 1980 the white collar and service industries in the United States have increased from just over 25% to almost two-thirds of the work force. (39:3) Whether this move away from the family farm and to the corporate office is a result of increasing technology or the increasing technology is invented in order to handle the additional working population is somewhat akin to the question of the chicken and the egg; which came first? Regardless, it is apparent new forms of technology are being designed to increase the effectiveness of the growing number of people involved in working with information. (32:3)

As discussed before, the small computer lends itself to many of the clerical functions that take place in the office environment. Many civilian firms are realizing the potential benefits of using small computers in the work place. Many have felt "that there is simply no alternative." (9:32). Different authors have given numerous reasons why a company should turn to automation, but the bottom line appears to be firms feel they have to resort to office automation to remain competitive. (9:32)

Ms Karen Birney, writing in the November 1986 edition of Nations Business, notes civilian companies tend to employ the four major types of software currently running on small computers. These major pieces of software are word processing, spreadsheets, database management and accounting. A brief description of each follows to acquaint the reader with some of their capabilities and the uses private industry has for them.

1) Word Processing - Basically a super typewriter within a computer, word processing allows a small computer user to compose, edit, store, and print documents. Word processing gives one the freedom to make mistakes and "typos" because they are

easily corrected. Documents can be stored and worked on at a later time and, when finished, they can be printed.

2) Spreadsheets - These software products are nothing more than large mathematical tables enabling a user to work on large amounts of numerical data. Ideal for projecting trends and playing "what-if," they allow one to change small amounts of data and then witness the changes this causes to all other information dependent on the initial change.

3) Database Management - These programs allow the user to manipulate and sort data. While spreadsheets normally are confined to numerical information, database management software deals with textual data. Company employee records, customer sales lists, and even cookbook recipes can be electronically stored within the computer and then retrieved any number of ways (e.g. "give me a listing of all recipes that use less than one pound of meat, bake for under one hour, and contain no eggs").

4) Accounting - These programs constitute the bulk of business and sales operations. Actually an assortment of smaller programs, accounting software handles such things as accounts payable and receivable, tax computations, and sales tabulations.

Ms Birney suggests professional firms, with their tremendous amounts of paperwork, rely heavily on word processing. She states that wholesale/distribution and manufacturing businesses, heavily dependent on extensive customer databases, are natural users of database management programs. Lastly, retail companies are growing very dependent on spreadsheets and accounting programs due to their ability to assist in long-range planning and recording sales activities. (9:33)

Any asset purchased by a profit oriented organization, regardless of its price or complexity, has to be assessed as to its ability to help increase profits. Obviously, a great many private companies have made the decision a small computer is such an asset. This point is often dictated by the very highest leadership positions within a company and is illustrated by the results of a recent survey conducted by Personal Computing. In responses from the Chief Executive Officers (CEOs) of 488 of the 500 largest corporations in America, 106 said they personally used a small computer in their office, at home or both. While the CEOs of companies like IBM and Zenith would be expected to be on the list, such "un-computer like" companies as Adolph Coors, Kellog and Quaker Oats also have enthusiastic small computer oriented CEOs. (14:131-132) The type of support towards small computers illustrated by the CEO survey has to have a major impact on the thinking of many companies. If the boss believes in the use and versatility of small computers, you can bet the rest of the organization is quickly falling in step!

Simply stated, many companies have seen what small computers can do for them and have invested heavily in them. These companies see the small computer "as a decision-making tool that helps you store, organize, maintain and analyze information." (13:95) So many company employees have come to believe in, and have grown accustomed to, the power of the small computer, an upsurge in the sales of small computers for the home should become more pronounced. Srully Blotnik, writing in the 20 Oct 86 issue of Forbes, feels many senior managers are looking for a home machine that duplicates the capability of the small computer they have in the office. (10:174). Such a statement indicates a great deal of America's businessmen have come to depend and rely on the uses of small computers.

THE LEARNING CURVE FOR PRIVATE INDUSTRY

> Anyone who has run a marathon can tell you that training is the key to maximizing your potential. One could say the same for personal computing proficiency. (15:111)

Many private firms have found the acquisition of a small computer will not produce an immediate increase in productivity. A learning curve is to be expected not only with respect to the technical skills required but to the mental attitude adjustment that must occur when using a new tool. This mental adjustment is a direct result of change forced on an organization because it is our human nature to want to remain with the status quo. (32:49) The manager of a firm wanting to acquire small computers has to be aware of this facet of human nature and deal appropriately. While there is no approved solution on how to deal with this resistance to change, it must be taken into account when installing new technology.

Managers of organizations can take a great number of steps to ease the transition to small computer usage. These include such mechanistic actions as office furniture alignment and lighting. In addition, it has proven to be beneficial to conduct personnel related activities such as stressing the worth of the individual employee and his or her decision making with regards to the computer acquisition. (32:51-55) Most importantly, it should be remembered no significant change in the workplace, technological or otherwise, comes about smoothly or quickly. It is impractical to expect rapid change in the work force when faced with a new advancement. This is best illustrated by William Bowen, writing in the 26 May 1986 issue of Fortune:

> Some of the disappointment with productivity payoff comes from expecting results too soon. Learning

> lags have occurred before in the annals of technology. For a while after typewriters came along, businesses used the machine to prepare drafts of a document then had the final version copied by hand for sending out. When it comes to using computers, many managers are still at the stage of redoing letters in longhand. (11:24)

Assuming a manager is successful in establishing an atmosphere in his firm receptive to small computers, he must then begin a program of educating his employees in the actual mechanics of the appropriate hardware and software. This training in the use of the computer and its programs is needed to fully utilize the power of office automation. In other words, "organized training will help you and your department members acquire experience in personal computing and maximize the knowledge you gain for time spent." (15:111)

Joanne Kelleher, writing in the December, 1986 edition of Personal Computing, notes most companies using small computers have come to rely on the following training methods:

1) Tutorials - Many of the new computers and software packages come complete with a self-paced learning program. Often included on a diskette, these tutorials can be used with the literature provided as part of the computer product. In addition, many firms are producing computer programs that are disk-based learning systems for some of the popular software used in the personal and business world. The advantage of these programs is their low cost and ability to be used at any pace. However, they are lacking when a student comes up against a problem not originally thought of.

2) Training Staff - Whether relying on oneself, another company expert, or a specially designed staff, certain managers have often found the expertise for training is inherent within the organization. This "in-house" approach allows a company to tailor the training its employees receive to meet the specific needs of the particular firm. In addition, it allows a company to set up areas of expertise for the computer products it uses. This helps to establish a positive support system in which answers to problems can be quickly obtained. The downside is quite often a company does not always have the needed expertise in all of the applications it uses and so the training program will be lacking in certain areas.

3) Formal Courses - Any number of agencies outside the company offer alternative training programs. Whether it be a course at a local university, an independent educational company program, or a class offered by a computer store, formal courses can offer a high degree of education. Many times these courses are taught by

recognized experts and their ability to both use the computer and to communicate that ability are highly respected. This training does pull employees away from business for the time they are taking the course; however, many of the programs, especially university courses, are taught at night and on weekends. Cost can be a consideration here but many firms feel it is worth the expense to have more productive employees. (15:111-117)

One last point to consider is the fact this need and desire for quality training has not gone unnoticed by the major computer companies. Increasingly, they have been expanding their educational projects and many computer companies have also been attempting to get their products into the classroom. Apple has become famous for making its computers available to elementary and secondary schools at low prices and has even donated hundreds of systems to schools throughout the country. (26:53-54)

The next big target for the computer firms is the college campus. While the potential market is enormous in terms of sales, a computer firm realizes that if it makes students familiar with its product early on, it just might have a customer for life. (26:53) This concept of training is so important that once a student learns to use a particular small computer, inertia may set in and that computer could be his system of choice for many years.

POTENTIAL PARALLELS BETWEEN THE CIVILIAN WORLD AND THE MILITARY

> The two went and stood side by side before a great mirror, and lo, a miracle: there did not seem to have been any change made! They stared at each other, then at the glass, then at each other again. (7:11)

While the military is concerned with many things that have no parallel within the civilian workplace, the office setting has some very unique similarities between the two. Many of the clerical and professional activities in the civilian world have similar situations in the military office. And even though the military is not concerned with sales and making profits, many of the motions we go through in dealing with budgets are indeed similar to civilian bookkeeping.

In a 1981 article for Datamation, Willie Schatz remarked "the office of the future is here, someone forgot to tell the federal government." (23:67) While some time has expired since these comments were made, it is still a valid point that the federal government is slow to bring about changes within the workplace. Representative of this is the slow process described earlier to acquire a standardized small computer for the Air Force, even after these machines had established themselves in the corporate

office suite. The military has, however, made significant progress towards applying the usefulness of small computers. This is, in no small part, due to the many lessons learned in the civilian workplace and the similarities that exist between it and the military office. (16:47-49)

My own experience has shown the military office also uses most of the major types of software for small computers. Without a doubt, the heart and soul of the military office is paperwork. The word processing capabilities currently existing on small computers can assist the Air Force staff officer in exactly the same ways it supports his civilian counterpart. The huge inventories kept in supply and tracking personnel are but two examples of how the Air Force is using database management programs. The entire Program Objective Memorandum (POM) process, with its out-years planning, is ideally suited to the capabilities of a computer driven spreadsheet. While there are certainly other areas in which the small computer can assist the military staff officer, these are three areas that have a direct correlation to the civilian business arena. This is reflected in the great number of software packages written for business the Air Force purchases and uses, all off-the-shelf. (24:65-66)

Much as in the business setting, the military leadership has found training is an important process in the incorporation of the small computer into the office setting. Office managers are cautioned not to expect their staff to become experts overnight with a new system and to provide for an adequate training process. (25:12) To obtain the most use of their new system, managers have to ensure a viable forum for obtaining computer education exists. (20:19) Certainly, the military has the same options for obtaining sufficient computer training as exists in the private sector. If anything, the military appears to be more receptive to having its members attend classes, and other training venues, possibly because it is not worried about the lost profit earning capacity of those people who are being educated.

Certainly, there are many parallels that exist between the private office setting and the military office. The power of the small computer, however, lends itself to some very unique situations within today's Air Force. These situations, along with the civilian-type office computer requirements, are presenting challenges both to the Air Force in general and the field grade officer in particular. Based on what has been learned from private industry, and what we know about particular Air Force requirements, it is imperative a look be given to the unique uses of the small computer within the Service. Specifically, I will address the role of the small computer in the Air Force and its impact with respect to the field grade officer.

Chapter Four

LET'S PUT THOSE COMPUTERS TO WORK! (AN ANALYSIS OF THE AIR FORCE WORKPLACE AND THE NEEDS OF AIR FORCE FIELD GRADE OFFICERS TO USE SMALL COMPUTERS IN THEIR DAY-TO-DAY ACTIVITIES)

THE WORKPLACE, THE MISSION AND THE FIELD GRADER

> This regulation establishes policy, objectives and responsibilities for managing Air Force communications-computer systems. It provides a management structure to improve Air Force combat capability and readiness. (29:1)

The above quotation from AFR 700-1 underlines the primary use and applicability of computers in today's Air Force: improving "combat capability and readiness." It further states the objective of Air Force communications-computer systems is to "implement and manage systems resources to effectively support the Air Force mission in war and peace." (29:1) While this statement encompasses the broad spectrum of all computer and communication systems, the small computer has the capability to contribute to the Air Force mission. Being able to improve many aspects of the Air Force workplace through the use of automation can free up Air Force officers for the more important tasks we have in front of us.

While not profit oriented, the Air Force still shares many goals with private industry. The civilian work force does not have a monopoly on efficency and budget oriented decision making. More effective utilization of the people and equipment assigned to it can enable today's Air Force to better accomplish its mission in an age of tightening budgets. The previous chapters have pointed out the many areas in which the small computer can improve the efficiency of the office. Now let us examine the Air Force workplace in particular and ascertain what, specifically, the small computer can do for us.

The Air Force workplace is a very diverse institution. It ranges from executive office suites in Washington, D.C. to remote detachments at far-flung bases throughout the world. Its setting is everything from "civilian type" offices to flight line operation rooms. The large office organizations in the Air Force

(Air Staff, MAJCOMs, other large headquarters) resemble the office environment of a major civilian corporation. Many office functions, such as document preparation, managing personnel records, and long-range planning, are very similar between the civilian and military workplace. The small computer can equally assist the civilian manager or the military staffer in getting a package to the boss. The unique value of the small computer to the Air Force, however, is with respect to its varied worldwide operations.

Because the Air Force is so diverse, a major task for our leadership is to pull together all of the separate functions into a viable fighting organization. The small computer can greatly assist in this. Major H. Wayne Wolfe, writing in his 1982 Air Command and Staff College research project, "Those Damned Computers", states:

> Major motivation for computerization of the Air Force has been the perpetual quest by Air Force leaders for information and control of processes to facilitate accomplishment of their missions. Information is a major source of power and a key to effective decision-making and control of processes. (35:3)

Due to the different and distant operating locations of the Air Force, the small computer can prove invaluable in tying together the many distinct operating elements. The decision-making required of today's leaders is enhanced by the many characteristics of the small computer that enable it to process and move information at a rapid rate. (35:3)

Crucial to this aspect of operations in varied locations and conditions is the concept, referred to in Air Force doctrine, of "centralized control...and decentralized execution." (28:2-18) In order for a commander to make the needed decisions to execute his centralized control, he needs as much accurate information as possible. Once the decentralized execution has taken place, an analysis of the results needs to be forwarded to the commander for additional decisions. The small computer, with its ability to store and process large amounts of information, is particularly suited to assisting the commander in pulling together the facts in order to make his critical and time-sensitive decisions. As AFR 700-1 states, in order to achieve the objective of using communications-computer systems to support the Air Force mission, one of the necessary requirements is to "provide commanders at all levels with timely and adequate information to maintain combat capability and readiness." (29:1) Expanding on this theme, Mr. Andrew E. Bilinski, Assistant Secretary of the Air Force for Command, Control, Communications and Computers, has stated:

> Today we have tens of thousands of these small computers being used to help our people do their jobs faster and better...We must also remember that the Air Force's fundamental doctrine of centralized control with decentralized execution depends on having adequate information links between the different force elements. Our communications and computer systems provide those links. (36:8)

It is apparent the small computer can prove to be invaluable in the evolution of the Air Force workplace and the accomplishment of its diverse and varied mission. But what of the field grade individual? Where does his use of the small computer fit into this scheme?

The field grade officer stands at that critical division between senior Air Force leadership and the rest of the commissioned and noncommissioned officer corp. His potential to participate in and influence the sharing, processing and transfer of information is tremendous. While it can be argued the majority of the actual mechanics of moving this information around will be performed by individuals lesser in rank, the field grade officer can exert a great deal of influence in the process. His knowledge of computer systems can have a positive impact on managing and leading those individuals charged with getting the correct information to a commander in a timely manner.

Hand-in-hand with this leadership role, the field grade officer often performs a staff function at a headquarters level. In this environment, his knowledge of office practices and routine can serve him just as well as his leadership ability. As we have already seen, there are many similarities between the military and civilian office. Just as many civilian managers are moving to actually use a small computer for their own day-to-day business affairs, more staff officers are seeing the potential of this automated machine and its ability to assist them in their respective jobs.

As pointed out in the second chapter, the small computer is starting to revolutionize the military office. It is imperative the field grade officer employ this new technology in order to help create a better office environment. An individual who has daily contact with the use and applications of the small computer is Captain John E. Richters, Chief of the Project Definition Office, Small Computer Division, Hq Standard Systems Center. His perception on the future use of small computers and staff (field grade) officers is that "to be really effective, middle managers need to know computers." His point was in the years to come, small computers will be a standard part of our doing business, and the officer who doesn't use (and know about) a computer will be at a serious disadvantage to the one who does. (38).

THE RAPIDLY APPROACHING FUTURE

> Victory smiles upon those who anticipate the changes in the character of war, not upon those who wait to adapt themselves after the changes occur. (3:30)

It is not too extreme to take this prophecy of Giulio Douhet, in reference to the emerging concept of airpower, and translate it into advice for the future role of small computers in the Air Force. Take, for example, the words of Assistant Secretary of the Air Force, Andrew E. Bilinski:

> We are finding increased use of small computers in almost every system that we are developing. We have recognized the need for the use of small computers to support the Air Force mission and, further, the challenges that we must face in the future...The Soviet Union and it's allies enjoy a clear numerical advantage. However, we have a qualitative advantage in the use of technology to support our missions. (30:8)

Clearly, the future use of the small computer can have a significant role in the future of the Air Force. To meet the challenges of the modern battlefield, commanders are going to demand quicker and more accurate information in order to make timely decisions. The small computer has the potential to participate in this rapid exchange of information. As new portable and ruggedized computers come on line, their use in the battlefield will only increase. My own experience has shown even today, the Air Force uses small computers on airborne command posts to quickly process updates to all aspects of an unfolding mission. As situations grow more complex, and small computers become more capable, this use of automated information exchange will only grow.

While the airborne or battlefield use of small computers is certain to increase, it will only be a small growth in relation to the utilization within the military office. As Peter Dube, writing in the October, 1986 issue of Government Executive, points out, the efficient use of new technology has "the potential for reducing costs and increasing productivity." (12:52) The need to achieve both of these goals will only increase as the Air Force is required to become more productive in an era of ever increasing federal budget consciousness.

My personal observations have seen the small computer become a highly productive piece of office equipment. As the Executive Officer to an Air Force major general, I witnessed quality work being produced in a timely and efficient manner through the use

of small computers. From document preparation to briefing charts, the small computer allowed our staff to produce work responsive to the needs of the "two-star." As large military offices more fully automate many of their functions, the productivity of the individual staffer is sure to increase.

But that is at the headquarters level. What of smaller units? A close parallel can be found in a discussion of automating an Army company. Writing in the January 1984 issue of Defense Science & Electronics, Jim Martin writes:

> The PC (personal computer) would also be a godsend in the average orderly room. Any company commander or first sergeant can tell you that preparing all the paperwork required in operating a company can be time-consuming, repetitive, and often apparently unnecessary. A PC could serve a number of purposes in a company or batallion headquarters. (18:35)

Many individuals see the small computer as being an extremely helpful assistant in any military organization. As we all become better informed, we'll think of more and better things for this powerful machine to help us with. As Major Runnels stated in the March 1986 TIG Brief: "The introduction of modern microcomputers has opened a floodgate of new ideas for enhancing the way we do our work. And we're only beginning." (22:15)

The era of the small computer is here and the mission of the Air Force can be greatly served by its efficient use. And, significantly, the Air Force field grade officer has the potential to be on the leading edge of this new application. But if the officer is to effectively utilize this machine, as well as lead other individuals in its use, he has to be trained and educated in some basic functions. For as his knowledge grows, so will his ability to optimize the power of the small computer. There are some places in the career of an officer where this training can logically occur. Professional Military Education schools offer such an opportunity.

Chapter Five

ITS TIME TO FIGURE OUT WHAT WE'RE DOING (AN ANALYSIS OF THE NEED FOR COMPUTER EDUCATION)

THE CASE FOR TRAINING AND EDUCATING FIELD GRADE OFFICERS

> Our technical training and operational training are inseparable from professional military training, in the sense that the development of skills and proficiency without commitment produces a force with and absence of purpose. (28:4-6)

The above quotation from AFM 1-1, Basic Aerospace Doctrine of the United States Air Force, stresses the need to combine technical training with other aspects of military education. It recognizes the "human element" in dealing with technology and seeks to improve overall competence in the skills needed to effectively participate in today's Air Force. (28:4-6) This philosophy can surely be put in the context of managing the use and application of small computers. The many new approaches to accomplishing the mission offered by the small computer demand a level of competence necessary to effectively utilize this new technology. Or, as AFM 1-1 states: "...education and training, enhance the competence of our personnel..." (28:4-6)

It is necessary to delineate the difference between education and training and how both play an active role in the learning process with respect to small computers. Webster defines education as "the action or process of being educated (provided schooling for)" while he states training is "the state of being trained (formed by instruction, discipline or drill)". (8:263,939) The difference is subtle, but important. Education provides an overall base of knowledge through schooling. Training, on the other hand, provides a skill, through discipline, that can be used to perform a particular action. An example might be made with respect to individuals in the aircraft industry. An aeronautical engineer, one who designs new airframes, receives a great deal of schooling, or education, in order to learn the many facets of aircraft design. His knowledge of things such as lift and drag, combined with other disciplines, enables him to produce and engineer new concepts in aircraft design. The aircraft mechanic, on the other hand, may not have received near the years of schooling but has received very

extensive drilling, or training, in a particular area of aircraft repair. He has had instruction and hands-on training with respect to his own unique area of expertise. This example does not mean to imply that one individual cannot receive both the education and training, but it is important to realize the instruction has been two separate entities.

This analogy of the aircraft engineer and mechanic serves us when viewing the education process with respect to small computers. A schooling, or education, in the capabilities and characteristics of the small computer is invaluable to certain individuals. Those who manage others who use small computers, who are involved in the acquisition of automated equipment, or depend on the output of these machines are examples of individuals who benefit from a knowledge of computers. On the other hand, those individuals who use a small computer directly, such as a secretary, an individual involved in data entry, or a military staffer personally preparing a written package, will require some form of training to learn the necessary skills required to operate the machine and the software running on it.

This explanation is necessary in order to detail the types of instruction needed by a field grade officer so he may work with small computers. It should be apparent that in given situations, different individuals will require varying degrees of education or training or both. The advent of the small computer in the Air Force workplace has necessitated the need for a certain amount of education and training. As pointed out in the first chapter, the first small computers used in the Air Force were often brought in from home or otherwise acquired by individuals. These people did not require a formal course of instruction in operating small computers; they were largely self taught. My own experience showed these individuals acted more or less independently with this new form of automation and their personal initiative enabled them to learn what was needed to perform operations on the small computer.

This period of relatively limited small computer usage has ended in the Air Force. As an increasing number of systems are delivered and installed, a high degree of proficiency in the use of small computers will be necessary. Let us not assume just having a small computer in place will automatically improve office efficiency. They have to be used intelligently in order to increase overall effectiveness. William Bowen, writing the Fortune cover story of 26 May 1986, "The Puny Payoff From Office Computers" indicates small computers have not brought about the large improvements in office efficiency they were designed for. One significant reason for this is a lack of experience and instruction. He states that "managers and consultants who have studied the problem offer several explanations for why computers have not improved white-collar productivity. Getting large

productivity benefits from computer systems usually requires a learning process." (11:20) Other individuals have commented on the need to improve individual proficiency in small computers. Henry Fersko-Weiss, writing in the June 1986 issue of Personal Computing, in "Managing your Employees to Level 3", discusses raising individuals to a higher degree of computer proficiency. He cites many leaders in industry who have found that increased education and training lead to better use and increased efficiency with small computers. (13:95-101).

The dilemma is where does the field grade officer fit into this need for varying degrees of instruction in the use of small computers? With the increasing use of these machines in the Air Force environment, a limited amount of education should be mandatory to point out the many capabilities, uses, and limitations of the small computer. While it is true not everyone will use a small computer in his or her daily job, they will surely have contact with, or manage those who do. Whether it be a junior officer, a secretary, or even a boss, most field graders will work with an individual who performs a significant amount of their job using a small computer. An increased education with respect to the small computer among field grade officers will contribute to the critical flow of information in the Air Force. As stated in the 20 February 1986 TIG Brief, managers should "give advance training and education to ALL employees who need familiarity with computers" and that "as managers, familiarize yourselves with the ins and outs of the computer. Enthusiasm for the system must come from the top down." (25:12)

But what of the field grade officer who uses a small computer on a regular basis? In this case, a certain amount of training will be required to enable this person to better operate the small computer. Even though the Air Force has adopted a standardized set of small computer systems, the many pieces of software written for the computer are varied. In order to fully utilize them, an individual will have to be trained in their use. As Robert J. Kent points out in the November/December 1983 issue of Government Executive, if professionals are doing a good portion of office clerical work, then those very professionals will need to learn about the use of the small computer in order to effectively operate in today's working environment. (16:47-49)

The entire thrust of this paper has been to show the small computer is becoming an indispensable part of doing business, both in the private sector and in the Air Force. This new tool does not, however, come free; it takes an amount of time to learn to use effectively. If the field grade officer is going to utilize this machine, then it is imperative he be given sufficient training in order to be an effective user of this new technology.

THE CASE FOR COMPUTER EDUCATION AT ACSC

> The mission of ACSC is to enhance the professional knowledge, skills, and perspectives of midcareer officers for increased leadership roles in command and staff positions. (1:33)

By taking mid-career officers from the spectrum of Air Force operations, the Air Command and Staff College (ACSC) has the capability to infuse a certain amount of education throughout the Service. There are many areas in which ACSC is educating field grade officers; one of these should be how to fully appreciate the new technology available. It can be argued not all officers attending ACSC will be going to jobs where they will be using small computers. However, very few will be going to an assignment that does not incorporate an aspect of small computer utilization. Because of this, it is important the field grade officers attending ACSC, who will have a tremendous ability to influence Air Force working habits in the years to come, receive a certain amount of education with respect to small computers.

This education does not have to be overly comprehensive or time consuming. It is suggested a set block of time during the Staff Communications Phase of the ACSC curriculum initially be set aside to present an overview of the small computer and outline some of its capabilities. The small computer has obvious characteristics that lend it to being discussed during this particular phase. Emphasis should be placed on the inherent uses of the small computer in the office setting, hence its discussion in the phase dealing with staff communication. Not only will these officers be given a sense of what small computers are all about, they will carry this information to their follow on duty assignments. Thus, the education given at ACSC will have an even farther reaching effect. A block of time on the order of two to four hours should be sufficient to cover the basics of small computers and present some of their capabilities.

On the other hand, there will be a significant number of officers going to an assignment where small computers are used on a frequent basis. (This number will most surely increase in the years to come.) For these officers, a greater amount of training can be of lasting value. Extensive electives, varying by the different software products available, can be taught to those who are interested. In this way, the students at ACSC can tailor their own needs, based on what they will use at their next duty assignment, and learn about specific programs that will have an immediate impact on their next job. Utilizing Air Force standardized computers, and popular software products, these officers will be given a basis for using Air Force small computers.

Lastly, an intensive amount of education and training should be provided to those individuals who remain on the ACSC faculty. It is vital they have a working knowledge of the small computer and its ability to enhance staff work and exchange pieces of information. With a small computer in each of the seminar rooms at ACSC, it is imperative an individual be available to the students who can answer their questions. In order to fully utilize these valuable assets, the students attending ACSC must know that there is a group of individuals ready to assist them in working with the small computer. The tendency now is to hope there is a fellow student who can answer questions about the small computer or try and hunt down one of the few faculty members trained in its use. This leaves a frustrated student and an under-utilized small computer.

IN CONCLUSION

This paper has attempted to show the history and applications of the small computer in today's Air Force. From somewhat humble and disorganized beginnings, both the Air Force and private industry have grown in their awareness of what the small computer is capable of doing. While the Air Force shares many common uses of the small computer with the civilian world, the critical flow of information needed in today's military necessitates the timely and powerful processing abilities offered by this new machine. These small computers cannot, however, be of any significance without educated and trained individuals overseeing their use. The field grade officer, as a critical manager and leader within the Air Force, has the capability to directly influence the future utilization of small computers and their ability to assist all of us in performing our job. Critical to this is a furthering of the education process. The Air Command and Staff College is a logical place to begin the education and training of future Air Force leaders as they explore and utilize technology that will carry us into the next century.

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