

USING PERSONAL DIGITAL ASSISTANT TECHNOLOGY TO CONDUCT FIRE  
PREVENTION INSPECTIONS

EXECUTIVE DEVELOPMENT

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## ABSTRACT

This research paper incorporated the use of personal digital assistant (PDA) technology with conducting fire prevention inspections. A lack of staffing to perform consistent inspections necessitated the consideration of the use of PDA and computer technology to increase the rate and effectiveness of facility inspections. The purpose of the project was to create (a) a PDA fire inspection application to be used for field inspections in lieu of the paper forms, and (b) a PC mail merge inspection report and cover letter that will use data collected from the PDA.

This research paper employed action research to (a) determine if there are any fire departments or other public service agencies using PDA technology to provide services, (b) ascertain if there are any private sector organizations that use PDA technology to increase their efficiency and profitability, (c) assess the importance of reevaluating programs that are not having the desired results, and (d) determine the technical options that must be considered before implementing a procedure based on PDA technology.

The primary modality employed was reviewing literature and previous studies on this technology in terms of increasing the effectiveness, efficiency, and profitability of organizations that have adopted this technology. For the literature review, extensive use of the World Wide Web was incorporated.

The primary findings of this research paper were that both the public and private sectors are successfully employing PDAs with both improvements in efficiency and cost savings. Options on various PDAs, operating systems, PDA to PC data synchronization, and form letter generation were also explored.

The recommendations from this research paper included the following: (a) the ARFF unit incorporate the use of PDA technology to conduct their facility fire inspections, (b) training

in the use of the technology be provided, (c) create a written procedure and instruction manual that addresses all aspects of the hardware, software, and the inspection process, (d) modify the fire inspection standard operating procedure, (e) a semiannual review of the inspection program, (f) an annual survey of airport tenants and ARFF personnel, (g) periodically evaluate changes in computer technology and upgrade options, and (h) as the process improves and grows, the other districts under the jurisdiction of the State of Hawaii could adopt the program.

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## INTRODUCTION

The Honolulu International Airport Aircraft Rescue and Fire Fighting (ARFF) unit provides fire suppression and emergency medical services for Honolulu International Airport and the surrounding community. Its primary mission is to provide airfield fire protection as prescribed by the Federal Aviation Administration (FAA). From the ARFF unit's inception in 1974, the unit did not have a fire prevention mission.

During the 1998 State legislative session, the responsibility of conducting fire prevention inspections of airport facilities was given to the ARFF unit. Prior to this change in law, fire inspectors from the City of Honolulu conducted fire prevention inspections at airport facilities.

This change in legislation created numerous problems for the unit. Although the mission of the ARFF unit was broadened to include fire prevention activities, no additional resources in terms of staffing or training were addressed. The problem is that the Honolulu International Airport Aircraft Rescue Fire Fighting unit does not conduct fire inspections in a timely and efficient manner.

The purpose of this applied research paper is to create (a) a PDA fire inspection application to be used for field inspections in lieu of the paper forms, and (b) a PC mail merge inspection report and cover letter that will use data collected from the PDA.

A literature review and active research methodology is used to determine the feasibility of adapting PDA technology to fire prevention activities. The research questions examined were:

1. Are there any fire departments or other public service agencies using PDA technology to provide services?
2. Do any private sector organizations use PDA technology to increase their efficiency and profitability?

3. Is it important to reevaluate programs that are not having the desired effect?
4. What technical options must be considered before implementing a procedure based on PDA technology?

### **BACKGROUND AND SIGNIFICANCE**

The Honolulu International Airport Aircraft Rescue and Fire Fighting (ARFF) unit was established in 1974 when responsibility for airfield fire protection was transferred from the Federal Government to the State of Hawaii. The primary mission of the ARFF unit is to provide airfield fire suppression as prescribed by the FAA. The FAA requires that the ARFF unit is capable of responding to the midpoint of the furthest runway within three minutes and to dispense fire-fighting agent (FAR 139, 1989).

The ARFF unit is an entity of the State of Hawaii's Department of Transportation. The unit consists of three shifts (17 personnel each) of full time paid personnel staffing two fire stations. The unit's equipment inventory includes six ARFF vehicles, three watercraft, one rescue unit, and one engine.

In the past, the ARFF unit did not have a fire prevention mission. The City and County of Honolulu's fire prevention bureau conducted fire safety inspections of airport facilities. In recent years, cutbacks in the Fire Prevention Bureau caused airport facilities to go uninspected. This led to ARFF management lobbying the State legislature to enact legislation so that the ARFF unit would have the responsibility to conduct fire safety inspections of State owned facilities at Honolulu International Airport. In 1998, Act 282 was passed and reads as follows

The inspection shall be made at least once each year at all public schools, or as often as deemed practicable or necessary by the county fire chief. The State shall conduct fire and safety inspections of all State owned airport facilities at least once a year.

This new mission created a problem for the ARFF unit. Although legal responsibility for fire safety inspections was passed on to the ARFF unit, no resources in terms of staffing, training, and budget were allocated. Being purely a fire suppression unit with no fire prevention branch, a program based on company inspections was rapidly implemented.

Presently, fire safety inspections are conducted in the traditional manner. The airport is divided among the three platoons, companies go forth to their designated area when staffing permits, and multi-copy forms are filled in by hand. The forms are then forwarded to one of the three airport fire commanders who is designated as the fire prevention coordinator (FPO). He then must reenter the data from the forms into a database that becomes the source for a form letter that is sent to the occupant of the facility. The fire prevention coordinator must also track compliance and schedule follow-up inspections. This process is problematic for the following reasons:

- The FPO is a shift worker. Being on shift means that he is only working ten days/month. Paperwork becomes backlogged in his absence and follow-up inspections fall behind.
- Even when the FPO is on duty, his fire prevention duties are secondary to his primary responsibility as shift leader and incident commander.
- Inspections can be performed only when there is sufficient staffing as not to compromise response criteria.



- Poor documentation and follow-up open the ARFF unit to liability in the event of a court challenge.

If the present process continues, the probable future impact on the fire prevention program is that inspections will lag further and further behind thus resulting in poor customer service, an increased fire risk, and liability issues. As long as shift personnel are conducting fire safety inspections, a means of streamlining the process is necessary.

This research is being conducted as a required component of the National Fire Academy's Executive Fire Officer Program. The problems noted in this research paper relate to *Unit 4, Managing Creativity*. This unit challenges students to consider creative and unconventional solutions to problems encountered by fire departments and where the public expects government to do more with less.

## LITERATURE REVIEW

### **PDA Technology in the Private Sector**

Personal Digital Assistant devices are becoming a necessity for business. These devices are small, easily transported, and are being integrated into the organizations' infrastructures to enable them to become more efficient and profitable (Mullins, 1999).

The review of literature shows that the use of handheld computing devices in the private sector is becoming commonplace. More than five million people in the United States own a PDA. By the year 2005, sales of handheld computing devices are expected to more than triple to nearly 17 million units. Businesses can now equip a worker with a \$300 PDA instead of a \$3,000 laptop computer and have the same level of productivity (Buechner, 2000, 43).

Famous Footwear, a division of Brown Shoe Company, is the largest family shoemaker in the United States with 927 stores in all 50 states. The company needed a quick way to check prices and reduce error. By giving stores handheld computers with scanners, an employee scans a barcode on the shoebox. This information is sent via a wireless modem to the store computer that in turn queries the corporate database via a private network. By incorporating this technology, Famous Footwear has eliminated 75 percent of all pricing errors. In the future, clerks will carry a small RF printer on their belts to print out the correct price for the item in question (*Famous Footwear*, n.d.).

Concentrating sales efforts without annoying present customers was a challenge for the sales force of the Atlanta Journal-Constitution. The paper has a daily circulation of more than a half million. A solution to this problem was found by giving the sales force handheld computers. Prior to the sales force going door-to-door, subscription information from the corporate computer was downloaded into the handhelds by address. This gave sales personnel access to those households that were current subscribers. Sales forces could then focus their efforts on those households that were not current subscribers. The implementation of PDA technology increased sales force productivity by 30 percent (*Atlanta Journal-Constitution*, n.d.).

Headquartered in Downers Grove, Illinois, ServiceMaster provides the cleaning service at 19 sites around the country for the entire fleet of Greyhound buses. In the past, written reports from all 19 sites were forwarded to headquarters where one person would compile and enter the information into a database. This database was then used as a basis for a weekly report to Greyhound. A means of streamlining this process was necessary. John Morrow, a service engineer for ServiceMaster, came up with a solution. "To better serve the customer and to improve the process there was consideration given for using some sort of handheld device to

collect and report." According to Morrow, using the PDA allowed for the inspection and reporting on a daily basis instead of weekly. The inspection process consists of 22 screens the inspector would navigate through. At the finish of each shift, all 19 locations would transmit their inspections via a modem to headquarters. This would populate the database from which reports were generated. Using a PDA standardized the inspection process, gave the process structure, and generated reports in a timely and effective manner (Niles, 2001).

Volvo Cars of North America had a similar problem with data collection. Quality assurance inspections are conducted at 4 United States entry points. The forty-item checklist was filled in manually and forwarded to corporate headquarters for compilation and report generation. This process took 3 weeks. "The whole paper-based system was very difficult to deal with," says Art Tybin of Volvo's Port Operations group. Volvo made a decision to replace the paper-based process with PDA technology. Using pick lists and check boxes on the PDA, manual data entry was eliminated. The information was then transmitted to Volvo headquarters where reports were compiled. Using PDA technology, Volvo's quality assurance reports were generated on a daily basis instead of being a 3-week process (*Results of*, n.d.).

American Medical Response (AMR) is the largest privately owned ambulance company that provides basic and advanced life support. Until recently, patient information was handwritten into forms at the scene of an emergency. A carbon copy would then be given to the hospital staff and the county fire department, and a copy forwarded to AMR's home office in Burlingame, CA. These 3 agencies would then manually enter the data from the carbon copies into their databases. It was found that manually consolidating the data was costly, expensive and compromised patient care. AMR decided that PDA technology could provide a solution. Data would be entered at the scene of an emergency into the PDA. This information would then be

transmitted by wireless modem to AMR headquarters where the information would be uploaded to the computer systems of the other agencies. Information is accurate and disseminated in real time (*Collecting Emergency*, n.d.).

### **Public Sector Success Stories**

The U.S. Army cafeteria in Fort Hood, Texas serves three meals a day for over 400 soldiers. One of the more important duties of the cafeteria is to capture the subsistence entitlements of each soldier. The traditional method for doing this is having the soldiers write their names, rank, service, and social security numbers on a clipboard as they enter the facility. If the soldier receives a subsistence allowance, the cashier would also collect the price of the meal. At the end of the day, cashiers would spend up to two hours manually entering the financial data into the main computer. Incorporating PDA technology, the Fort Hood cafeteria now scans the ID cards of soldiers as they pass through the line. The device also does calculation of how much money each diner owes. The PDA then uploads this information into the database of the cafeteria's main computer where managers use the information to see in real time how many meals have been served and whether more meals have to be prepared. This real time capability made it possible to improve planning and minimize food waste (*U.S. Army*, n.d.).

Officers of the Montgomery County, MD police are using handheld computers that record traffic stop information. In a mock traffic stop given to the press, an officer could write a traffic citation in 45 seconds using the PDA. After the end of shift, the officer uploads the traffic citation information into the computer at headquarters. Says officer Chris Johnson; "It makes it a lot easier than filling out the paperwork, handing it to someone, who gives it to someone else, who gives it to a data entry person." The device also holds state and local statutes, telephone numbers, a court calendar, and police procedures. The hand held computers also transmit

information via infrared light. This allows a beat officer to "beam" the initial crime scene information from his PDA to the detective in charge. Using PDA technology, it cut the paperwork of the department to a fraction of its former amount (Drake, 2000).

The Rolling Meadows, Illinois and Highland Park, Texas police departments are using handheld computers running a program called "PocketCop" developed by Public Safety Group. This program allows police officers to query state and federal crime databases via a wireless connection (Keegan, 2000).

One of the many tasks the U.S. Postal Service performs is documenting errors made during the handling and delivery of mail. The paper-based system for reporting errors took from weeks to months. A new system using PDA technology was initiated to speed up this process. Employees now scan bar codes on mailbags to report the type of handling error. At the end of the day, the information is uploaded to the agency's central computer in Washington, D.C. Reports on handling errors can now be generated daily. "It used to take reports 6 months to be processed. Now, they are available in a matter of hours," said Clayton Bonnell, Manager of International Operations at USPS (Haubold, 2000).

Fire inspectors of the Los Angeles Fire Department inspect 180,000 properties documenting such items as violation history and a list of standard violations. Reports are then transmitted to the fire prevention office via wireless modem. Prior to the use of PDA technology, inspectors used clipboards handwriting their reports after each inspection. The City had to hire data entry personnel to input the data into the fire department's computer system. This process created long delays from the time of the inspection to when the notice of violation was sent out. Using the handheld solution, letters of non-compliance are sent to property owners within

twenty-four hours. The Los Angeles Fire Department has saved \$123,000 from higher collection rates for violations and reduced data entry costs (*Los Angeles*, n.d.).

Doctors from the Portsmouth Naval Medical Center in Virginia were challenged with keeping track of patient information and history by using index cards. Poor handwriting and incomplete data became problematic when information needed to be passed on to the various relieving shifts at the hospital. A more effective way of communicating patient information was needed. A solution came when the hospital decided to use PDA technology. Pertinent patient information could be quickly entered on the handheld device by using checklists and pull-down menus. During shift change, the physician would "beam" all patient information into the relieving physician's PDA, thus eliminating errors and saving valuable time (*Naval Medical*, n.d.).

### **Attitudes Towards a Changing Mission**

The IFSTA text *Fire Inspection and Code Enforcement* (1987) states that "Fire prevention inspections are the single most important non-fire fighting activity performed by the fire service" (p. 5). Bare (1977) expands further that it is the goal of the fire service to prevent fires

Whenever possible, a community fire prevention program should be a balance of enforcement and educational activities. If people are aware of the importance of the fire prevention program, the purpose of code regulations, and the necessity for enforcement of the code, then strict enforcement action will only be a sometime thing (p. 184).

Osborne and Gaebler (1992) noted that the public has high expectations of its institutions. They note the reason for sluggish performance lies in the fact that Government does not purge ineffective policies and practices as in the private sector; they merely add more

regulations until the public revolts. Eggers and O’Leary (1995) had this to say regarding change, “Though resistance to change is the hallmark of all large organizations, the current crisis in government demands that anything short of fundamental change in the public sector is no longer a viable option” (p. 21).

Having a successful fire prevention program also calls for changing the political climate towards fire prevention. In *Reinventing Government*, Osborne and Gaebler (1992) note

Prevention is a hard sell in a political environment. Where leaders have embraced it, they usually have been driven by unavoidable financial or political pressures. Prevention is not nearly as attractive to politicians as a visible response to crisis. Prevention is quiet, but politicians who mount all-out attacks on symptoms generate public publicity (p. 235).

The authors further note that most public officials have no idea which programs are successful and which ones are not. They noted “When they cut budgets they have no idea if they are cutting muscle or fat. Lacking objective information on outcomes, they make their decisions largely on political considerations” (p. 147).

A community’s fire prevention plan should be designed to reflect changing conditions of the community. A plan should be modified if changes occur that affect the fire safety of the community and when programs are not producing the desired results (Coleman and Granito, 1988). They further suggest that management reassessment of the community’s fire prevention program be an ongoing process.

Grant and Hoover (1994) note “fire departments exist to provide services to the community on the basis of what it needs, not on the basis of what the fire department or its members want to provide” (p. 275). They address a concept of “environmental scanning” in which fire officers identify and examine social, political, and technical information both inside

and outside of an organization. The value of this is preparedness, having the ability to adapt to changes in the community.

### **PDA's and Operating Systems**

A PDA is a lightweight, hand-held computer designed for use as a personal organizer with communications capabilities. A typical PDA has no keyboard, relying instead on special hardware and pen-based computer software to enable the recognition of handwritten input, which is entered on the surface of a liquid crystal display screen. In addition to including such applications as a word processor, spreadsheet, calendar, and address book, PDAs are used as notepads, appointment schedulers, and wireless communicators for sending and receiving data, faxes, and electronic-mail messages (Columbia, 2000). However, Buechner (2000) notes that converting to a PDA is a major step in an organization. Handsizing means that the user will have to give up the traditional method of documenting events and the feel of hardcopy for using a stylus on a touchscreen.

The major players in the PDA market are Palm, Handspring, and Sony. All of these devices use the Palm operating system. The Palm units hold a staggering 72% of market share. Microsoft introduced the Pocket PC into the PDA market to cut into the Palm's domination of total sales. Hewlett-Packard, Casio, and Compaq introduced PDAs that run on Microsoft's Pocket PC operating system. These companies did not see the same growth as Palm. Casio's share declined to six percent in 2000 from 11 percent in 1999. Hewlett Packard slipped to 2.3 percent from 2.9 percent, and Compaq's iPaq had a modest rise in market share from practically nothing to 2 percent (Tam, 2001). According to Palm, there are more than 55,000 developers and 5,000 applications available for the Palm platform whereas support for Microsoft's Pocket PC operating system is dwindling (*Palm handhelds*, n.d.).



Wayner (1996) reported that Palm solved the PDA to PC data sharing problem that had limited the usefulness of other PDAs. The Palm PDA comes with a cradle that is connected to the serial port of the PC. With the touch of a button on the cradle, information on the PDA and PC become synchronized. This synchronization can also be performed remotely by using a modem or wireless connection.

In a recent comparison article published by Nelson (2000), the Palm operating system was a clear winner over the Microsoft product. This evaluation was based on the following criteria:

- Cost
- Ease of use
- Synchronizing data from the PDA to a desktop PC
- Handwriting recognition
- Expandability
- Stability

Buechner (2000) also came to the same conclusion. A summary of PDAs compared is in Table A1.

### **Collecting, Storing, and Reporting Data**

In a recent online article, Thompson (2001) credits the real power of the PDA to collecting data into a variety of third-party database applications. The two types of database products on the market are general and mission specific database applications. General database applications are inexpensive and allow the user to easily design and create their own database. Mission specific applications require some knowledge of programming and are generally written by professional programmers.

Braden (2001) further divides the general type database applications into a flat-file or relational database structure. Relational databases link to other databases and flat-file are self contained. The author uses the analogy of an encyclopedia and a book. In an encyclopedia, information can be cross-referenced to other volumes whereas in a book on a topic, the information or topic can be found within the book. Braden summarizes prices and features of general database programs in Table A3.

As reported by Price (1994), fire departments are continually being asked to do more with less. Computer technology is one area where cost savings can be achieved while improving service to the community.

In summary, a review of published material disclosed sufficient information to proceed with the research project. Valuable insights were gained into the breadth of the technology in the public and private sector, PDA hardware, operating system, and database application options, and the importance to reassess programs that are not having the desired effect. The work of Osborne and Gaebler (1992) was especially insightful in their comparison of public and private sector paradigms towards change and customer service.

## PROCEDURES

### Definition of Terms

**Database** - A collection of information organized in such a way that a computer program can quickly select desired pieces of data.

**Flat-file Database** - A relatively simple database system in which each database is contained in a single table. In contrast, relational database systems can use multiple tables to

store information, and each table can have a different record format. Relational systems are more suitable for large applications, but flat databases are adequate for many small applications.

**Graffiti** - A handwriting recognition system that uses a simplified alphabet to enter text into a PDA with a stylus.

**Hardware** - Refers to objects that you can actually touch, like disks, disk drives, display screens, keyboards, printers, boards, and PDAs.

**IrDA** - Short for Infrared Data Association, a group of device manufacturers that developed a standard for transmitting data via infrared light waves. Increasingly, computers and other devices (such as printers) come with IrDA ports. This enables the transfer of data from one device to another without any cables.

**Mail Merge** - A feature supported by many word processors that enables you to generate form letters. To use a mail-merge system, you first store data in one file such as names and addresses. In another file, you write a letter, substituting special symbols in place of names and addresses (or whatever other information will come from the first file).

**Microsoft Windows 95/98** - A family of operating systems for personal computers.

**Operating System (OS)** - The most important program that runs on a computer. Every computing device must have an operating system to run other programs. Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen or printer, and keeping track of files and directories.

**Personal Digital Assistant (PDA)** - A generic term for a small handheld device that can combine computing, telephone/fax, and networking features. Most PDAs are pen-based, using a stylus rather than a keyboard for input. This means that they also incorporate handwriting recognition features.

**PIM** - Acronym for personal information manager, a type of software application designed to help users organize personal information. PIMs enable the entry of various kinds of textual information such as notes, lists, appointments, addresses, and calculator functions.

**RAM** - Acronym for random access memory, a type of computer memory that can be accessed randomly. RAM is the most common type of memory found in computers and other devices, such as printers.

**Relational Database** - A type of database management system (DBMS) that stores data in the form of related tables. Relational databases are powerful because they require few assumptions about how data is related or how it will be extracted from the database. As a result, the same database can be viewed in many different ways. An important feature of relational systems is that a single database can be spread across several tables. This differs from flat-file databases, in which each database is self-contained in a single table.

**Software** - Computer instructions or data. Anything that can be stored electronically is software. The storage devices and display devices are hardware.

**Spreadsheet** - A table of data arranged in rows and columns. Each data can have a predefined relationship to the other data.

### **Research Methodology**

The desired outcome of this research paper is to develop a standard operating procedure that uses PDA technology to enhance the effectiveness of the fire prevention inspection process. Action research methodology was applied to fulfil the provisions of this assignment.

A literature review was initiated at the National Emergency Training Center (NETC) Learning Resource Center (LRC) in Emmitsburg, Maryland. Subsequent research was conducted

at various public libraries in the Honolulu, Hawaii area. Reviewed were books, magazine articles, trade journals, and extensive review of information on the World Wide Web.

### **Assumptions**

The development of the PDA inspection application assumes the following:

- Items in the literature reviewed were documented in a fair and unbiased fashion
- Knowledge of basic computer skills
- Familiarity with the Windows and Palm operating systems
- Microsoft Word and Excel computer programs
- Familiarity with the 1998 Uniform Fire Code
- Knowledge of conducting fire safety inspections

In developing the pilot PDA inspection application for the ARFF unit, the author's Handspring Visor™ (Palm OS PDA) was used. The actual inspection application for the PDA was created with a relational database program called HandBase™. This database program allows the user to enter inspection details by tapping list items and check boxes, thus minimizing the need for manual data entry on the PDA.

### **Limitations**

The six-month time limit given by the Executive Fire Officer Program for the Applied Research Project prevented the programming of "polished" PDA application. Although fully functional, the PDA portion of the project is still a work in progress. Further refinements in the programming will be made, as the process is fine-tuned.

The ARFF unit's existing data processing equipment also had a bearing on the final product. Programs and documents created by the PDA had to be compatible with the Windows 95/98 environment, Microsoft Word, and Microsoft Excel.

## RESULTS

The fire prevention inspection PDA database program structure is shown in Table A1 and Figures B1-B14.

### Answers to Research Questions

1. Are there any fire departments or other public service agencies using PDA technology to provide services?

The literature review revealed that fire inspectors from the Los Angeles City Fire Department use PDAs to survey over 180,000 properties during brush season to ensure that they are clear of vegetation. The information is entered via a touchscreen on the PDA and sent by modem to headquarters. The city managed to save \$123,000 from data entry costs (*Los Angeles*, 2000).

PDAs are now commonplace with the U.S. Postal Service, U.S. Army, U.S. Navy, and police departments to collect, organize, transmit, and process data. These organizations have shown an increase in efficiency and cost savings by using these devices.

2. Do any private sector organizations use PDA technology to increase their efficiency and profitability?

PDA technology in private sector organizations is more deeply rooted than with their public counterparts. Large corporations such as ServiceMaster, Greyhound, The Atlanta-Constitution, Volvo, and American Medical Response use PDAs to collect data quickly and

minimize paperwork. The use of wireless connected PDAs also allow greater decentralization of employees by allowing them to exchange information with their main office from any location worldwide. It is also more cost effective for the companies to provide their employees a \$300 PDA than a \$1500 notebook computer.

3. Is it important to reevaluate programs that are not having the desired effect?

Much has been written on how the dynamic of change affects large organizations, especially those of government. In *Reinventing Government*, Osborne and Gaebler (1992) point out how government does not reevaluate many of their programs. Businesses routinely purge themselves of product and programs that are not profitable. Instead of making a self-assessment, government merely adds more layers of rules and regulations until there is a public outcry.

They further note that fire prevention is a hard sell on a political level. It is much easier and attracts more attention to respond to a crisis than to quietly support fire prevention programs.

Grant and Hoover (1994) state that attitudes within the fire service also need to be changed. In *Fire Service Administration*, they write “fire departments exist to provide services to the community on the basis of what it needs, not on the basis of what the fire department or its members want to provide” (p. 275).

4. What specific technical options must be considered before implementing a procedure based on PDA technology?

The choice of a PDA revolves around what operating system the unit has licensed. The two competing operating systems for handheld devices are Microsoft’s Pocket PC and the Palm OS. The latter of the two is according to the literature the clear winner of the operating systems (Buechner, 2000; Nelson, 2000). Companies that use this system are Palm, Handspring, and Sony. These products were judged superior for their handwriting recognition, ease of use,

number of third-party programs available, and lower cost. The Palm devices also have a 72% market share and are still growing.

A number of third-party database programs for collecting fire inspection data are available for the Palm devices. These programs range from simple flat-file database that store information in a table format to those that have relational capabilities. A relational database can be linked with other databases to form complex relationships.

Changing the way people have been collecting information for most of their lives must also be addressed. Buechner (2000) notes that users of a PDA must exchange the comfortable feeling of pen on paper to a stylus tapping list items on a touchscreen or using a simplified alphabet called “graffiti” to enter data.

### **PDA Database Structure**

The fire inspection program is divided into two parts. The first part is the facility information where the occupant of the building is identified (Figure B1). Tapping the stylus on the *Facility* field calls a list of tenants at Honolulu International Airport. To make a selection, tapping the stylus on the desired tenant inputs the information into the field. All other occupant information is entered in the same manner. The *Date* field is entered automatically from the PDA’s internal settings.

The second portion of the program is where fire inspection data is entered (Figure B2). Inspection deficiencies are divided into the following categories:

- Permits (Figure B3)
- System (Figure B4)
- Extinguishers (Figure B5)
- Occupancy Separations (Figure B6)



- Housekeeping (Figure B7)
- Exits (Figure B8)
- Flammable Liquids (Figure B9)
- Hazardous Materials (Figure B10)
- Electrical (Figure B11)
- Gas (Figure B12)
- Storage (Figure B13)
- Remarks (Figure B14)

Tapping the stylus on any of these categories will again present a list of the most common code violations for that particular category. A second tap of the stylus on the particular violation will enter the data in the appropriate report field on the PDA.

### **PDA to PC Data Synchronization**

Downloading the data captured on the PDA to the PC requires that the PDA be placed into a cradle that is sold with the unit. Pressing a button on the PDA cradle initiates a download of data from the handheld device onto the hard drive on the PC.

Once the data is transferred to the PC, the file is converted to a Microsoft Excel spreadsheet by a conversion program that is sold with the HandBase PDA database program. Address information is automatically added to the converted spreadsheet via a link to the master address spreadsheet that is also on the PC. The spreadsheet with the address information now added becomes the data file for the eForm (Appendix D) and accompanying letter from the airport manager (Appendix E). The eForm and letter are Microsoft Word mail merge documents that obtain selective information from the spreadsheet and places the information in the

appropriate places on the eForm and letter. The forms and letters are then printed and are mailed on the same date as the facility inspection.

## DISCUSSION

The PDA inspection program is no substitution for a fully staffed fire prevention division. The use of PDA technology and the development of the inspection application is a tool to facilitate the inspection process by reducing the amount of time performing the inspection and processing the associated paperwork by operations personnel.

A number of hardware and software options exist on the market. This author researched what others have said regarding PDAs, operating systems, database applications, and use of this technology in both the private and public sectors. Based on such factors as cost, reliability, ease of use, and comparisons performed by others (Table A2), this author decided that the best PDA for this pilot project would be the Handspring Visor. This product uses the popular Palm operating system, has more memory than other PDAs costing more, and has an expansion slot for upgradability.

This technology is inexpensive, relatively easy to learn and use, and is compatible with the existing unit's data processing equipment. The PDA database application file structure can also be easily modified and fine-tuned to meet the needs of the airport community (Table A1). The touchscreen method of data entry is faster, less prone to error, and is easily converted to a PC format (Niles, 2001; *Results of*, n.d.). The forms and letters generated by this process can be mailed on the same day of inspection and are more presentable than the traditional handwritten, multi-copy forms. This reflects a greater degree of professionalism on the ARFF unit and is more consistent with the way the private sector does business. This approach to problem solving is

consistent with concepts expressed in the works of Osborne and Gaebler, *Reinventing Government* (1992) and the National Fire Academy's Executive Fire Officer Program, *Unit 4: Managing Creativity*.

The adaptation of PDA technology in conducting fire prevention activities by the Honolulu International Airport ARFF unit is a first for the State of Hawaii. The intent of using this technology is to support the widening scope of the unit's mission in a time of decreasing resources. The fire inspection program can be freely downloaded (<http://www.ddhsoftware.com/gallery.html?show=Technical>) by anyone interested in adapting this technology for fire prevention.

### **RECOMMENDATIONS**

Based on the research the following items are recommended:

1. The ARFF unit should incorporate the use of PDA technology to conduct their facility fire inspections.
2. Training in the use of the PDA, entering information into the database, PDA to PC synchronization, and document generation should be conducted prior to the pilot program.
3. Creation of a written procedure and instruction manual that addresses all aspects of the hardware, software, and the inspection process.
4. Modification of the fire inspection standard operating procedure to reflect the inclusion of using the handheld device and inspection procedure.
5. A semiannual review of the program by performing a comparison study of buildings inspected in prior years.

6. An annual survey of airport tenants and ARFF personnel on the effectiveness of the program should be conducted.
7. Changes in computer technology and upgrade options should also be considered periodically.
8. As the process improves and grows, the other districts under the jurisdiction of the State of Hawaii could adopt the program. Businesses leasing property from the State would receive concise and professional appearing documents in a timely fashion. Business owners would benefit by becoming aware of fire safety issues by regularly receiving these inspection reports. ARFF personnel could perform fire inspections and process the reports with a minimum of operational down time. Inspection data entry would be consistent by standardizing the manner in which code violations are “tapped” out on the PDA.

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*Appendices Not Included. Please visit the Learning Resource Center on the Web at <http://www.lrc.fema.gov/> to learn how to obtain this report in its entirety through Interlibrary Loan.*