

Department of Airports

Staffing Study of Facilities Maintenance Trades Occupations

(Project No. 01-M-03)

This document is the result of a collaboration between the Department of
Airports and the Office of Financial Management & Budget,
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Executive Summary

Palm Beach County operates four public airports, including Palm Beach International Airport, one of three fields in south Florida served by international carriers. For most of the decade of the Nineties, the Department of Airports underwent repeated staffing contractions in response to loss of scheduled air carriers and general “belt tightening.” By early 2001, Airports management was looking to fill out its staffing roster among trades occupations in its Facilities Maintenance Section.

Report Highlights . . .

Our review of the staffing of trades occupations at the Department of Airports found:

- ☑ *The Facilities Section’s work management systems are not adequate for the proper controls of effective workload management;*
 - ☑ *The Section has handled the implementation of its automated work management systems poorly;*
 - ☑ *Critical maintenance tasks are getting increasingly backlogged;*
 - ☑ *The addition of three trades positions could help relieve the behind-schedule status of key maintenance tasks.*
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In response to a request from department management, the Management and Program Analysis Section conducted this study to examine the staffing requirements for trades occupations and to assess the workload-to-staffing balance among Building Maintenance, Industrial Electricians, and Heating, Ventilation and Air Conditioning positions. This report contains the results of that study, in the form of findings and recommendations. James Godfrey, Senior Management and Operations Consultant, was the lead analyst assigned to this project.

The study found that there has been a nearly decade-long trend of declining staffing in each of the three main occupational groups covered by the study. At the same time, maintenance responsibilities have generally continued unabated, and have recently begun to show signs of strong recovery. The study team came to this conclusion despite a pervasive lack of basic operational and management data about the work of the Facilities Maintenance Section. The Section’s work management systems—both manual and automated—are not adequate for department managers and supervisors to exercise proper controls, and do not track work load activity, timeliness, or cost. For these and other reasons, the study team makes the following three principal recommendations:

- The Department of Airports should reevaluate its approach to implementing the automated maintenance management system for the Facilities Section;
- The Facilities Section should establish interim standards and procedures concerning input of work activity into the existing computerized system to serve until the evaluation recommended above can be completed.
- Three maintenance positions should be added to the Facilities Section, effective at mid-year FY 2002.

Department of Airports: Trades Positions Staffing

A study to examine the staffing requirements for trades occupations and to assess the workload-to-staffing balance among Building Maintenance, Industrial Electricians and Heating, Ventilation and Air Conditioning positions.

The purpose of this report is to provide department management with insights into the adequacy of various trades occupations employed in the department's Facilities Section.

The study focused on three occupational units in the Facilities Section—Building Maintenance, Industrial Electricians, and Heating, Ventilation and Air Conditioning—and their current workloads, including backlogged activities, and the management systems in place to support work accomplishment. In this manner, the study team was able to make a determination of the minimum number of staff necessary to carry out the assigned work.

- Several considerations affected the completion of the study. Most notable was an absence of reliable workload data. Information relating to work activities—quantity, hour value, on-schedule status, average time to completion, frequency distribution of open work orders by priority level—was not available or incomplete for all trades groups, preventing an accurate quantification of overall workload and or workload trends and projections.

The methodology used in this study included all of the following:

- Physical inspections were conducted of all county-operated airports, including assembling photographic documentation of Palm Beach International Airport.
- Federal Aviation Administration (FAA) requirements pertaining to airport maintenance were reviewed.
- Various affected staff and managers were interviewed

- Work methods and procedures used in providing maintenance services were examined.
- The organization chart and duties and functions of the Facilities Section staff were analyzed.
- Facilities Section staff rosters and personnel schedules were reviewed.
- Overtime, compensatory time and sick/personal leave time records (where available) were studied.
- Statements of work, work orders, condition of facilities and independent facility inspections were reviewed and analyzed.

Factual Profile

OVERVIEW

The County operates four public airports, including three general aviation fields and Palm Beach International Airport (PBI). PBI is one of three international airports serving urban southeast Florida, along with Fort Lauderdale-Hollywood and Miami International. PBI provides around-the-clock service through a variety of international, national, and regional air carriers. Each of the four local airports is managed by the county's Department of Airports.

The facilities vary in terms of age, size, and number and types of appurtenances. A brief description of each airport follows:

- Palm Beach International Airport (PBI) is located in eastern Palm Beach County near the city of West Palm Beach on a 1,866-acre site surrounded by residential and commercial development. It has a 10,000-foot primary runway, a 6,930-foot crosswind runway, and a 3,152-foot general aviation runway. The 560,000 square foot terminal building, which opened in 1988, includes a two-story concession mall, two passenger concourses and a separate commuter concourse and holding area. There are 1,100 short-term parking spaces on top of the terminal and 2,300 long-term spaces at ground level. In addition to the terminal building and its associated parking garages, other landside facilities occupying the north side of the airport include rental car agencies, a fuel farm, cargo facilities, overflow parking, a flight kitchen, a water treatment and storage plant, and a maintenance warehouse.
- Palm Beach County Park Airport (Lantana) is located 10 miles from PBI (a 20 minute drive) on a 630-acre site. This facility, opened in 1945 to civilian use, includes a terminal building, hangars, office space, a fuel farm, and three runways.

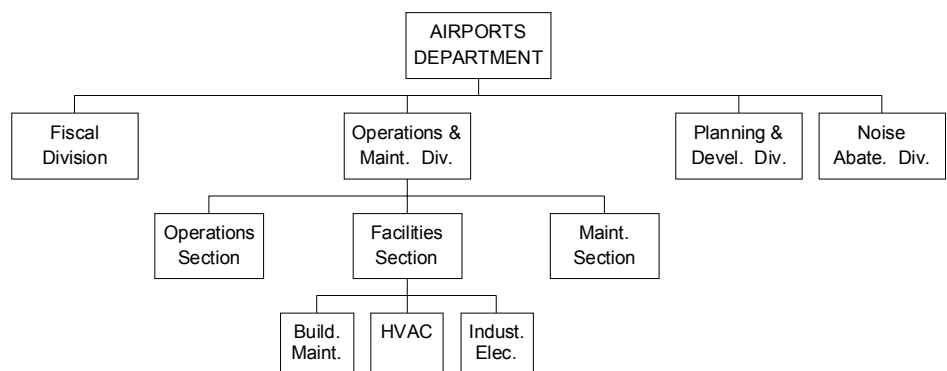
- Palm Beach County Glades Airport (Pahokee) is 43 miles west of PBI (a one hour drive) and is situated on a 243-acre site. This facility, which opened in 1949, includes a terminal building, hangars, office space, a fuel farm, and a single runway.
- North Palm Beach County General Aviation Airport is 20 miles northwest of PBI (a 30 minute drive) and is situated on a 1,832-acre site. This facility, which opened in 1994, includes a terminal building (6,757 sq. ft.), hangars, office facilities, a water treatment facility, and three runways.

Maintenance and upkeep of the physical plants, major equipment, and airfield infrastructure at the four sites are provided by the Operations & Maintenance Division of the Airports Department, through its Facilities Section. Services generally include plumbing, painting, carpentry, sign maintenance, heating, air conditioning and electrical repair and maintenance. Renovation and remodeling construction are also performed on a cost-recovery billable basis to airport tenants. Grounds maintenance is provided by others in the Operations & Maintenance Division, while custodial duties and large construction projects are contracted to commercial providers.

The chart below depicts the organizational placement of the Facilities Section within the Airports Department. An expanded organizational chart is included as *Appendix 1*.

FIGURE 1

Current Organization Chart of the Department of Airports



For the main PBI facility, services provided by the Facilities Section include the upkeep and maintenance of the terminal building and its associated parking garages and other landside facilities. Specific equipment maintained includes

automatic sliding doors; emergency standby equipment; terminal and exterior lighting; fire alarm, public address, flight information, and security card access systems; communications monitors; telemetry equipment (e.g., gate sensors, vehicle notification system); lift stations; and all air conditioning units, sump pumps, cooling towers, air compressors and pneumatic controls (*Appendix 2*). In 1998, additional equipment was added at PBIA, including:

- one 600-ton chiller
- four chill water pumps
- one condenser pump
- three variable frequency drives for main chill water facility

For the three general aviation airports, equipment maintained includes electrical power and lighting systems for the airfields, hangars, and terminal buildings, as well as various navigation aids (e.g., wind socks, rotating beacons, etc.). Water treatment equipment and an alarm/fire suppression system are also maintained at the North County Airport.

FACILITY MAINTENANCE PROCESS

In carrying out its maintenance service responsibilities, the Facilities Section makes use of both manual and automated work management systems. Maintenance work activities are classified according to six types:

<u>Activity Type</u>	<u>Definition</u>
Emergency	Repairs requiring immediate action to avoid serious injury or equipment/facility damage
Installation	Set-up of equipment for use or service, or installation of a door or wall
Locating	Assist contractors locating equipment, power lines, etc.
Trouble calls	Incidents reported by others for repairs
Preventive Maintenance	Programmed maintenance on equipment and buildings
Other	Wildlife problems; contractor escort

When the process functions as intended, each type of activity is to be assigned to one of three work categories, depending on the nature of the work involved, and whether a charge-back for services is anticipated:

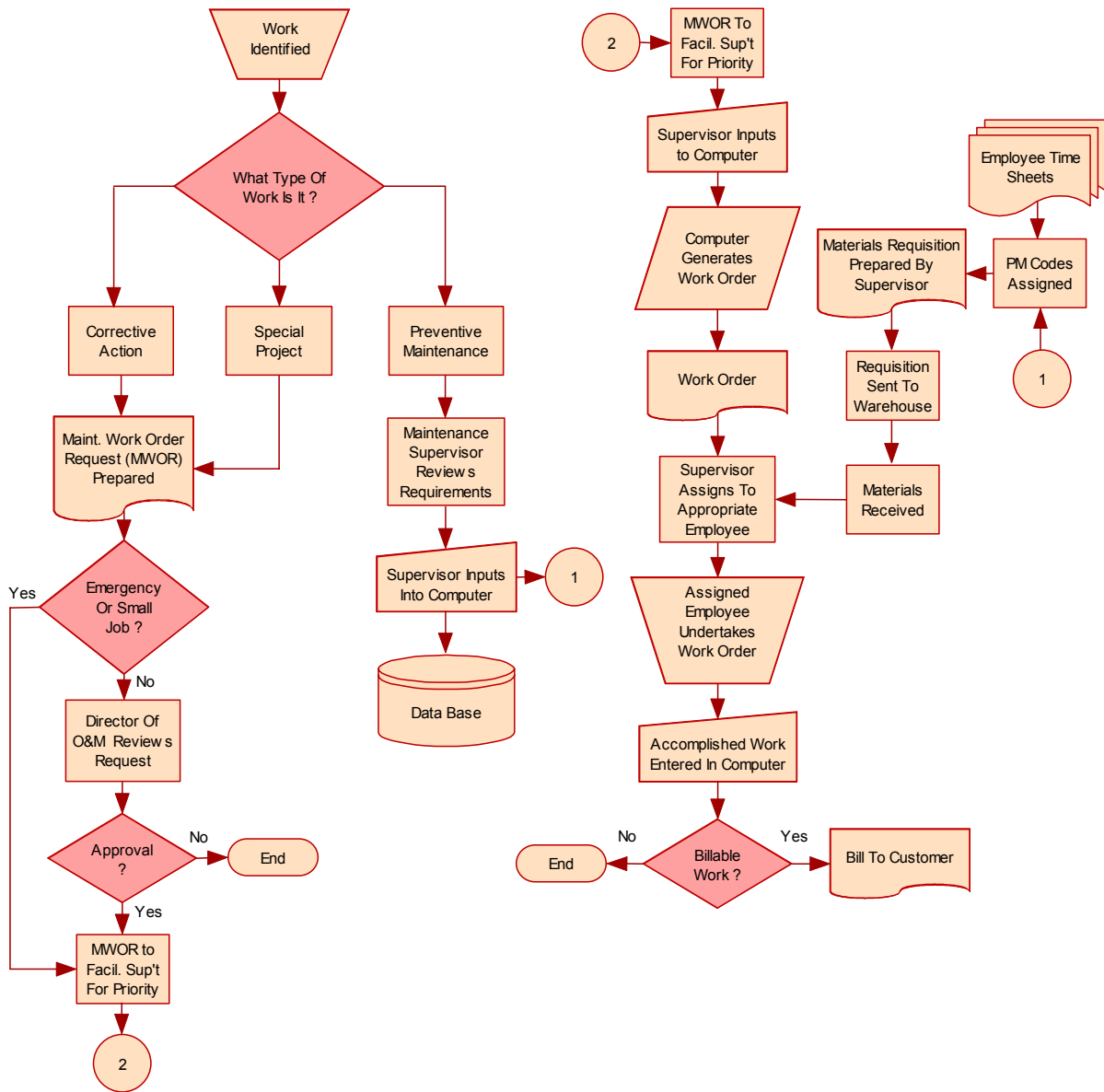
- Corrective work
- Project work
- Preventive maintenance

Each category of work involves a series of steps for work authorization, materials' procurement, and cost accounting. Billable cost recovery is

additionally involved in cases of tenant-ordered construction projects. A flow diagram of the principal steps in the process is depicted below. Following that is a brief description of the automated maintenance management program and descriptions covering each of the three categories of work above.

FIGURE 2

Workflow Diagram of Major Categories of Facility Maintenance



Service Monitoring and Tracking

For those operations where large and extensive maintenance requirements exist, the need for effective maintenance management systems also exists. Task scheduling, tracking and reviewing, parts and materials procurement, inventory control and accounting, and management reporting, all must be accommodated in a way that balances the cost of generating and maintaining detailed data with the usefulness of the information generated for management control purposes. The following discussion focuses on the automated system currently used by the Facilities Section to manage maintenance workload.

In 1992, the Airports' Facilities Section began use of a computerized maintenance information system called "GP Mate." According to documentation provided with the system, GP Mate documents and tracks information related to all phases of the maintenance cycle, including work order planning, tracking, completion, cost accounting, and archiving; repair order planning, tracking, completion, cost accounting, and archiving; parts classification, reservations, issues, receipts and returns; inventory counts, turnover, valuation, tracking, and cost accounting; maintenance personnel scheduling, tracking, and labor cost accounting; equipment classification, tracking, repairs, and cost accounting; and purchase planning, tracking, and cost accounting.¹

Some work order data has been maintained in the GP Mate system since its implementation in 1992. However, in response to several requests for reports showing workload patterns and backlogged activities, the study consultant was informed that any data generated from the GP Mate system would be incomplete and largely inaccurate.² In general, two explanations were offered for this situation: (1) not all tasks are input into the GP Mate system. As the number of emergency and trouble calls increases, fewer tasks are input into the system due to time constraints;³ and (2) tasks are inconsistently and incorrectly coded in the system. For example, the Superintendent indicated that the HVAC unit may use the Electrical unit's preventive maintenance charge, and trouble calls are routinely charged as preventive maintenance work.

Much of the capabilities of the computerized maintenance management system appear to be unused, in part the result of a widespread perception that the software is tedious and time-consuming to use. Work scheduling, in particular, largely bypasses the computerized maintenance management program. Work is prioritized primarily through daily "muster" sessions held each morning, at

¹ GP Mate User's Guide and Reference Manual, p. I-1. [See also *Appendix 3*]

² Personal interview with Facilities Superintendent, April 27, 2001. [See also *Appendix 4*]

³ Similarly, problems identified during daily airfield inspections (*Appendix 5*) are not input into the computer, and findings from the Annual Airports Facilities Inspection may or may not be entered.

which assignments are made for the day, without specific reliance on computer-generated reports to identify pending or backlogged priority work.

For reasons of this sort, there is a limited amount of data available to the managers and supervisors as a source of useful workload information for corrective actions, including trends and backlogs, or for focusing on the highest criticality assignments, or to identify the magnitude of the current preventive maintenance effort, or for maintaining cost controls on materials and labor. Not least, line managers have no reliable information concerning the sheer volume of pending maintenance tasks.

Maintenance Categories

Corrective Work

The repair work activities of the Facilities Section are initiated by a “Maintenance Work Order Request” document (*Appendix 6*). This document can be generated by PBIA staff, fire station staff, airline representatives, and other responsible personnel, as well as from recommendations contained in annual facility inspection reports.⁴ Examples of these work order requests include checking ceiling leaks, replacing tile, responding to electrical equipment failure, and replacing fire hoses throughout PBIA. Once generated, the work request document is forwarded to the Director of Operations & Maintenance for authorization.

If approved, the document is submitted to the Facilities Superintendent for further processing, including preventive maintenance code and priority assignment. Priorities are defined as follows:

- Priority 1 (P1) highest priority; immediate action
- Priority 2 (P2) before close of business
- Priority 3 (P3) lowest priority; as soon as possible

The Facilities Superintendent then assigns the task to the proper Maintenance Supervisor. At this point, if the process functions as intended, a “Corrective Action” work order (*Appendix 7*) is produced by the Maintenance Supervisor via the department’s computerized maintenance management program.⁵

If parts or materials are necessary to complete the work order, a companion requisition document is also issued (*Appendix 9*). The Maintenance Supervisor lists the item description on the requisition, and then forwards it to the Airports’ warehouse for ordering and for inclusion of a document number and document date. A copy is returned to the Facilities Section for filing. Once

⁴ See discussion of Annual Airports Facilities Inspection beginning on page 10.

⁵ According to the Facilities Superintendent, the corrective action work order process is not often used because it is consider too time-consuming to input required data into the work order system. [See *Appendix 8* for a list of preventive maintenance codes]

the part arrives, a receiving document is sent to the Facilities Section to alert them of the part's status and to close the requisition.

As work is performed, each employee completes a weekly time sheet to allocate work time among his or her assigned work orders (*Appendix 10*). These weekly time sheets are then used by the supervisor to add employees' names, their reported labor hours and dates of work, and work order completion dates on a hard copy of the previously generated work order.

Upon completion of the task, the reported labor hours and materials' costs are entered into the GP Mate program by the Facilities Superintendent's secretary (*Appendix 11*).

**Project
Work**

The process for project work is identical to the Corrective Work process except that a specific work order number, rather than a preventive maintenance code, is assigned by the Facilities Superintendent to track costs for potential charge-back to airlines and other tenants for services rendered.

Project work can be requested by airlines or department personnel, including the Facilities Section. Recent examples of project work have included constructing television cabinets for the executive lounge and modifying airline ticket counters.

**Preventive
Maintenance**

The Facilities Maintenance Section's preventive maintenance program consists of two separate collections of maintenance activities covering electrical and heating, ventilation and air conditioning systems, respectively. The items comprising these collections of activities are selected by the affected supervisors. Each of the Maintenance Supervisors reviews equipment manufacturers' recommended maintenance schedules, along with FAA Advisories and loss prevention surveys to determine the frequency of potential PM tasks.⁶ The respective supervisors then input data into the computerized work order system on a selective basis.⁷ Detailed work descriptions do not presently accompany the PM tasks, nor do schematics or recommended parts lists intended for use with each maintenance activity.

The weekly time sheets used to record employee labor hours serve as preventive maintenance work orders (*Appendix 12*). A preventive maintenance code, representing a pre-defined category of maintenance tasks (*Appendix 8*), is assigned to each work order, and the preventive maintenance is performed. Examples of such work orders include re-calibration and testing of all carbon

⁶ See discussions of FAA Advisory Circulars and of loss prevention surveys (Industrial Risk Insurers), beginning at page 13.

⁷ According to the Facilities Superintendent, not all items requiring preventive maintenance have been entered into the computerized maintenance management system.

monoxide sensors, cleaning exhaust fans, replacing air filters, and programmed maintenance of transformers and generators.

Once a PM is completed, the Facilities Superintendent's secretary enters the labor hours and preventive maintenance code into the computer under the appropriate work order number.

Where Work Originates—Service Requests and Other Sources

Facility maintenance operations at PBI A must respond to maintenance requirements generated from several sources. These include repair work requests from PBI A staff and management, Fire-Rescue Department staff, airlines and other responsible personnel, and preventive maintenance schedules. In addition to these sources of maintenance requests, facility maintenance operations at PBI A must respond to maintenance requirements generated from three external sources:

- Annual facility inspections required by bond covenants
- FAA Advisory Circulars governing airport maintenance; and
- Loss prevention surveys conducted by outside insurance carriers.

A discussion of the maintenance requirements imposed on the Airports by these external sources follows.

Annual Facilities Inspections

Each year, as required by the county's 1984 bond covenants, an inspection of facilities at PBI A and the three general aviation airports is made by outside engineers to determine the condition of these facilities (*Appendix 13*). For 1999, this inspection was completed and a report prepared by the firm of Dames & Moore.⁸

In order to assess the condition of airport facilities, Dames & Moore first segregated the infrastructure of each airport into three types: 1) airside and landside facilities; 2) building facilities; 3) mechanical, electrical, and plumbing facilities. The condition of each facility type was then graded using the scale depicted on the following page. Finally, specific items requiring attention, designated as "items of concern" by the consulting engineers, were identified and classified according to the following recommended actions:

- Routine maintenance;
- Periodic monitoring required;
- Beyond routine maintenance; requires repair;
- Requires further investigation;
- Immediate action required

⁸ *Annual Airports Facilities Inspection for the Department of Airports Palm Beach County*, prepared by Dames & Moore in association with Hillers Electrical Engineers, December, 1999. The 1999 report is the most recent document available at the time of this study.

Excellent	—	System was observed in better than satisfactory condition; corrective action was not required.
Good	—	System was observed with no concern; corrective action was not required. System appeared to be within its estimated useful life.
Fair	—	System was observed and warrants periodic monitoring to determine if any action beyond routine maintenance is required. System appeared to be approaching its estimated useful life. Any corrective actions required may be performed during routine maintenance.
Poor	—	System was observed requiring immediate corrective action. Condition is beyond routine maintenance and requires repair to avoid a hazardous condition. System appeared to have exceeded its estimated useful life.

Note: See also *Appendix 14*

Those items identified by Dames & Moore that are the responsibility of the Facilities Section are listed in *Appendix 15*. The results of Dames & Moore’s inspection for 1999 have been tabularized in *Appendix 16*. A brief overview of Dames & Moore’s findings for each facility, and the status of corrective actions taken to date, reveals the following:

Palm Beach International Airport (PBI A)— Landside and airside facilities were rated in “fair to good” condition with concerns mostly relating to landside and airside pavement surfaces and the facilities’ “curb appeal.” The overall condition of the terminal building was judged “good to excellent.” The inspection of the facility revealed that the majority of the deficiencies noted were within the scope of routine maintenance. PBI A’s mechanical, electrical, and plumbing systems were generally found to be in “fair” condition, with ongoing maintenance performed on a routine basis. Many of the items noted during the inspection were due to the effects of climate and age and were outside the scope of routine maintenance.⁹ Of twenty-eight items of concern cited by the inspection that were the responsibility of the Airport’s Facilities Section, seven were considered beyond routine maintenance and nine were determined to require immediate action.

The study consultant and the Facilities Superintendent conducted a review on March 16, 2001 to determine the status of the twenty-eight items of concern cited in the 1999 inspection. Three items (11%) had been completed as of that date.

⁹ Dames & Moore Report, Section 1, pp. 1-2, 1-5 and 1-6.

Palm Beach County Park Airport (Lantana)—This site was rated in “fair to good” condition with minor concerns. Overall, general maintenance to the site had not improved since Dames & Moore’s last observation in 1998. Drainage items and airfield pavement conditions still appeared to be an issue for this site. The overall condition of the buildings at the airport was found to be “good.” Mechanical and electrical systems were found to be in generally “good” condition.¹⁰ Of the nine items of concern cited by the inspection that were the responsibility of the Airport’s Facilities Section, six were considered beyond routine maintenance and one was determined to require immediate action.

The review conducted by the study consultant and the Facilities Superintendent on March 16, 2001, regarding the nine items of concern cited in the inspection revealed that no items had yet been completed.

Palm Beach County Glades Airport (Pahokee)—This site was rated in “fair to good” condition with concerns mostly relating to landside pavement surfaces and the facilities’ “curb appeal.” The overall conditions of the terminal building and main hangar were rated “poor”. General maintenance to the terminal building and main hangar appeared to have been neglected for some time. Mechanical and electrical systems were rated to be in overall “good” condition.¹¹ Out of twelve items of concern cited by the inspection that were the responsibility of the Airport’s Facilities Section, one was considered beyond routine maintenance and nine were determined to require immediate action.

The review conducted by the study consultant and Facilities Superintendent on March 16, 2001, regarding the twelve items of concern cited in the inspection revealed that one item (8%) had been completed.

North Palm Beach County General Aviation Airport—This site was rated in “good” condition with concerns mostly relating to airside drainage, the access roadway’s filter drain system, and non-airside pavement surfaces. Overall, general maintenance to the site appeared to have improved since Dames & Moore’s last observation in 1998; however, drainage items noted in the previous year still appeared to be an issue. The overall condition of the terminal building was rated as “good”; however, the terminal building’s exterior siding and wood window trim were observed to be in poor condition. The building’s wood siding had severe rot. Mechanical and electrical systems at the airport were rated in “good” condition.¹² Of the seven items of concern cited by the inspection that were the responsibility of the Airport’s Facilities Section, six were determined to require immediate action.

¹⁰ *Ibid.*, Section 2, pp. 2-2 and 2-3.

¹¹ *Ibid.*, Section 3, pp. 3-2 and 3-4.

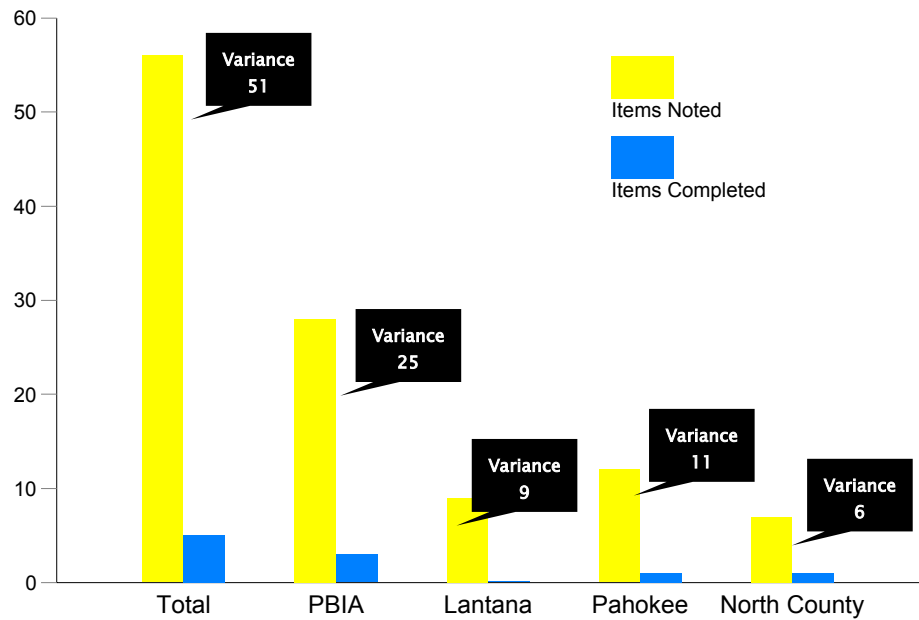
¹² Dames & Moore Report, Section 4, pp. 4-2, 4-3 and 4-4.

The review conducted by the study consultant and Facilities Superintendent on March 16, 2001, regarding the seven items of concern cited in the inspection revealed that one item (14%) had been completed to date.

The graph below compares the status of corrective actions taken to date for each facility as well as for all facilities combined. Of a total of fifty-six items of concern cited in the 1999 Dames & Moore Inspection Report, five items (9%) had been completed as of March 16, 2001.

FIGURE 3

**Status of Corrective Maintenance Actions
(As of March 2001)**



At the time of the consultant’s on-site field observations, several painting and corrosion control projects identified in the 1999 inspection report were proposed to be accomplished by use of temporary labor for three months at an estimated cost of \$9,600.¹³

**FAA Advisory
Circulars**

The Federal Aviation Administration has issued various “Advisory Circulars” which provide guidelines for maintenance of airport “visual aids,” defined as equipment used to assist in the safe and efficient movement of aircraft during

¹³ Internal memo dated March 1, 2001. [See also *Appendix 17*]

landing, takeoff, and taxiing maneuvers. Examples of such equipment include runway and taxiway edge lighting systems, wind cones, and rotating beacons. Advisory Circulars are advisory in nature, and do not have regulatory force of law.

The following Advisory Circulars (ACs) address various categories of visual aids (see also *Appendix 18*):

- AC No. 150/5340-26 lists those preventive maintenance (PM) tasks for the primary visual aid equipment;
- AC No. 150/5340-21 describes standards for the inspection, testing and maintenance of airport miscellaneous visual aids;
- AC No. 150/5340-17B describes standards for the maintenance of standby power.

The preventive maintenance programs detailed in these Advisory Circulars include recommended frequencies for specific PM activities that range from daily, weekly, monthly and bi-monthly, to semi-annually and annually. An example of a PM program for rotating beacons is included as *Appendix 19*.

The Facilities Superintendent has indicated that no preventive maintenance has been undertaken in the areas covered by the ACs in the past twelve months. Rather, the Section has responded to Fire Department and Operations Officer reported problems (e.g., lights not functioning) as they occurred.

Industrial Risk Insurers

Industrial Risk Insurers (IRI), a commercial insurance carrier, provides property damage coverage for various county facilities including PBI. In February of 2001, IRI conducted a survey at PBI to identify potential situations which might result in property loss (*Appendix 20*). As a result of that review, IRI recommended more frequent inspections of five specific categories of fire protection alarms, controls, and suppression equipment. The Facilities Superintendent estimates the impact of the additional inspections to be 100 man-hours per year, affecting both electricians and plumbers.

FACILITY MAINTENANCE ORGANIZATION

The Facilities Section consists of thirty-two positions, twenty-five of which are classified as “trades” (crafts) positions. These positions are organized into three operational units:

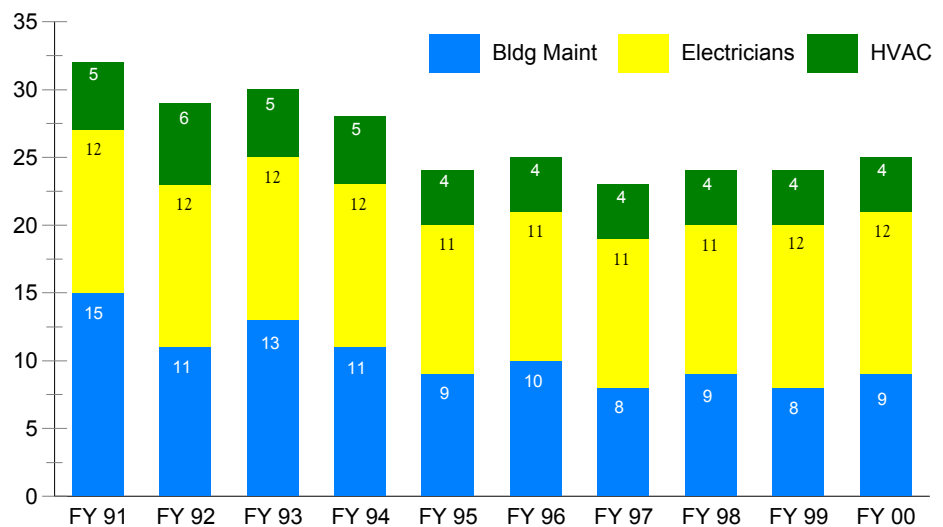
- Building Maintenance
- Heating, Ventilation and Air Conditioning (HVAC)
- Industrial Electricians

Each unit reports through a Maintenance Supervisor to the Airport Facilities Superintendent.

Figure 4 below traces the history of trades positions staffing in the Facilities Section by operational unit over the past ten years. For the Facilities Section as a whole, the staffing levels have ranged from a high of thirty-two positions in 1991 to a low of twenty-three positions in 1997. According to the Director of Airports Operations and Maintenance, the reduction in trades positions from 1991 to the present has been due primarily to the pull-out of Eastern Airlines, the outsourcing of maintenance for the North Palm Beach County General Aviation Airport, and general economic “belt tightening.”

FIGURE 4

**Staffing History of Trades Positions
(Fiscal Year 1991 - Fiscal Year 2000)**



Building Maintenance Unit

The Building Maintenance unit consists of nine employees staffing five different types of trades positions. General duties for each type of trades position are shown in the table on the following page. Staff in each service area is also responsible for emergency calls and contractor escorts. Services are provided to PBIA as well as the three general aviation airports. Job descriptions are included for additional reference as *Appendix 21*.

Staffing levels of the Building Maintenance unit have ranged from a high of fifteen positions in 1991 to a low of eight positions in 1997 and 1999. Building Maintenance staff work day shifts only, Monday through Friday, 7:30 a.m. - 4:30 p.m. (refer to *Appendix 22*, Building Maintenance unit). Crews remain on call in the event of emergencies after normal work hours. Overtime has not

been significantly used by the unit, averaging 0.12 FTE per year over the past five years.¹⁴

TABLE 1

Trades Staffing Complement and General Duties of the Building Maintenance Unit

Trade	No. Staff	General Duties
Plumber	2	Maintain restrooms, lift stations, fire pump and fire system sprinklers check, backflow and drain line maintenance
Painter	2	Maintain interior and exterior walls and all other paint requirements and apply rust inhibitors on all piping throughout terminals
Carpenter	3	Make all wood repairs, cement repairs, ceiling and floor tile replacement/repairs, roof repairs and wall modifications
General Maintenance Mech.	1	Assist all other maintenance functions, passenger seat repairs, caulking and carpet strips
Sign Technician	1	Maintain, fabricate and install signs

In order to monitor Building Maintenance unit activities, the Building Maintenance Supervisor prepares a spreadsheet-based report called the “Terminal Maintenance Projects Report” (see *Appendix 23* for a sample report page). This report lists a portion, but not all, of the open work orders for the unit. Smaller projects or emergency projects are sometimes not included. The report is organized by trade and prioritized by the supervisor depending on availability of staff and materials, and includes comparative information on planned date of completion versus action completed to-date for each work order.

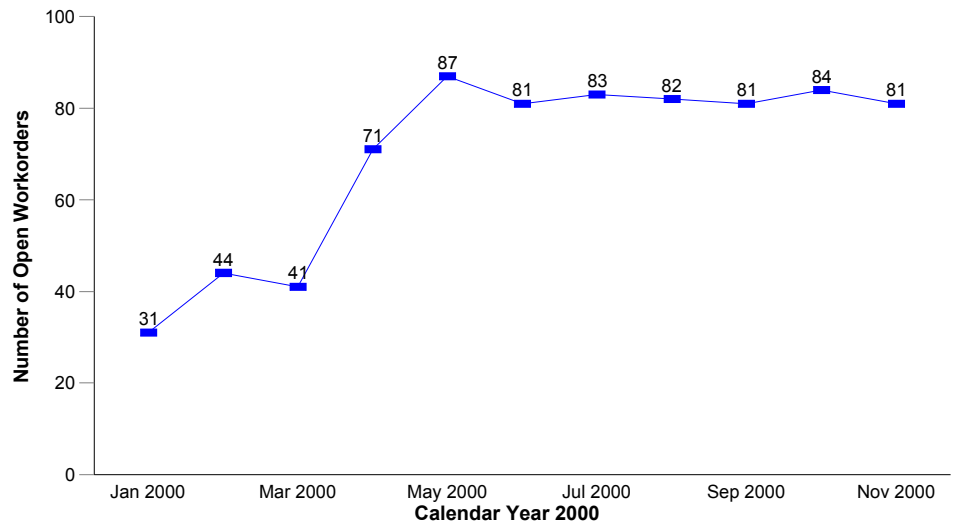
A review of available Terminal Maintenance Projects Reports for calendar year 2000 suggests that the Building Maintenance unit has seen a growth of open tasks. As shown in Figure 5, the first quarter of calendar year 2000 averaged 39 open work orders with the last three months averaging 82 open work orders.¹⁵ Using information contained in the most recent Terminal Maintenance

¹⁴ OFMB calculations from PBC Payroll Report No. ZOT9101

¹⁵ Created from data summarized by the study consultant from available PBI Terminal Maintenance Projects Reports for calendar year 2000 (11 months).

FIGURE 5

The Number of Open Work Orders Has Increased Significantly Over the Past Year



Projects Report as of March 12, 2001 (*Appendix 24*), the study consultant calculated the average number of months behind the planned completion dates for open “Priority 1” corrective actions. The results of these calculations are tabulated below. On average, Priority 1 tasks appear to be more than three months behind, with tasks assigned to carpenters and the sign technician experiencing the longest delays.

TABLE 2

Some Priority 1 Tasks Are Seriously Behind Schedule

Trade	No. Priority 1 Tasks	Average Months Behind
Carpenter	11	4.6
General Maintenance Mechanic	6	1.8
Painter	8	1.3
General Maintenance Mech.	8	1.1
Sign Technician	8	7.5
Total	41	3.3

Source: OFMB calculations from March 12, 2001 Terminal Maintenance Projects Report

Heating, Ventilation and Air Conditioning Unit

The HVAC unit consists of three Air Conditioning and Refrigeration Specialist II positions and one Security Door Technician position. The unit operates under indoor air quality standards established by the county. These standards, which are applicable to all county-owned facilities including PBLA, are contained in countywide PPM # CW-L-037, titled “Indoor Air Quality (IAQ) Program” (*Appendix 25*). Specifically, this PPM requires the Airports to:

- Design and renovate HVAC systems in accordance with the indoor air quality guidelines of the American Society for Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); and
- Develop departmental policies and procedures addressing design, renovation and preventive maintenance for HVAC systems.

Services are provided to PBLA as well as the North County Airport. A job description for the Air Conditioning and Refrigeration Specialist II position is included for reference as *Appendix 26*.

HVAC staff provide facility coverage seven days a week 7:30 a.m. - 4:30 p.m. In order to provide this coverage, a rotating shift schedule is used (*Appendix 22*, HVAC unit). Staff is on call in the event of emergencies after normal work hours.

As can be seen from Figure 4 on page 15, HVAC staffing has ranged from a high of 6 positions to its current staff of four over the past decade. Overtime has not been a significant factor, averaging just 0.08 FTE per year over the past five years.¹⁶

The HVAC Supervisor estimates that approximately eighty percent of the HVAC unit’s duties involve preventive maintenance. This includes programmed maintenance of the main central chiller plant, return and supply fans for terminal air conditioning, ventilation duct work and all daily, weekly and monthly maintenance on all air quality equipment (*Appendix 27*). A review of eleven available preventive maintenance schedule histories for this unit from 02-29-00 thru 3-29-01 (*Appendix 28*) indicates that of 198 scheduled PM activities, 115 (58%) were completed.

HVAC staff also has the responsibility of maintaining the air conditioning systems at the North County Airport (*Appendix 29*).¹⁷ This responsibility was formerly contracted out, but became a county responsibility in late 2000. According to the Airport’s Finance Department, the contract cost for this

¹⁶ OFMB calculations from PBC Payroll Report No. ZOT9101.

¹⁷ *Appendix 29* contains a list of all items at the North County Airport requiring service. Items that are the responsibility of the county are denoted by a “C”.

effort was \$12,234 in FY 2000. Dissatisfaction with contractor performance is said to have led to the assumption of those duties by the department.

Industrial Electricians

The Industrial Electrician unit consists of twelve Industrial Electrician positions. Responsibilities include maintaining runway and taxiway lighting, rotating beacons, electrical distribution for PBIA (e.g., high voltage substations, transformers, etc.), interior and exterior lighting and emergency standby equipment. Services are provided to PBIA as well as the three general aviation airports. A job description is included for reference as *Appendix 30*.

The unit provides facility coverage seven days a week 24 hours a day to ensure that all electrical components are in proper working order at all times. In order to provide this coverage, a rotating shift is used to ensure one Industrial Electrician is on duty at all times (refer to *Appendix 22*, Electrical unit). The shift hours are as follows:

- First Shift 7:30 a.m. to 4:00 p.m.
- Second Shift 3:30 p.m. to 12:00 a.m.
- Third Shift 11:30 p.m. to 8:00 a.m.

As can be seen from Figure 4 on page 15, the staffing level of the Industrial Electricians unit has remained virtually constant over the past ten years. Over the recent past, this unit has made some use of overtime. During the past five years, there has been a gradual increase in authorized overtime, amounting to just over one-half of one full-time equivalent position in fiscal year 2000.¹⁸

Findings and Recommendations

This part of the report is divided into three main sections—General Findings, Recommendations, and Implementation. As appropriate, analyses of the issues are included in the first two of these sections. We begin with a summary of the essential conclusions reached by the study team as a result of its work on behalf of the department.

GENERAL FINDINGS

The preceding sections of this report have described the existing operation, organization, and staffing of the Airports' Facilities Section, including the Building Maintenance, HVAC, and Industrial Electricians units. Through a process of extensive on-site field observations and interviews with affected employees, the study team offers its assessment with respect to staffing and workload balance in the three units. The following specific findings describe

¹⁸ OFMB calculations from PBC Payroll Report No. ZOT9101

the study team's conclusions and are the bases for recommendations which follow later in the next section.

The Section's work management systems are not adequate for department managers and supervisors to exercise proper controls

In operations where large and extensive maintenance requirements exist, as they do here, the need for effective maintenance management systems also exists. An effective system addresses task scheduling, tracking and reviewing for quality control; manpower planning; parts and materials procurement; inventory controls and accounting; and management reporting in a manner which is both efficient with individuals' time and effective as a control mechanism. We have found each of those things to be missing to a significant degree here. Neither the Section's automated work order system nor its manual workload management processes produces sufficiently reliable information for maintaining cost controls, or for focusing available manpower on the highest criticality assignments, or for assessing workload trends and identifying backlogs and other impediments. Work scheduling, in particular, now takes place without reliance on any systematic understanding of pending or backlogged priority work.

The Section's approach to the development and implementation of its automated maintenance management system was not well conceived and has not been effectively carried out

For much of the past decade, the Section has had an automated maintenance management system in place. The need for an adequate means of systematically tracking maintenance activities and equipment service records is clear, and it appears likely that the GP Mate software acquired for that purpose has the capacity to meet the need. What is not evident from its current use is that the specific elements of the department's maintenance management information needs were ever systematically identified or evaluated, nor that the objectives or resource requirements of computerization were well understood. The results we have observed are that: 1) there is no structured approach or timeline for full implementation and utilization of the system; 2) key users are effectively free to bypass the system; and 3) resources needed to efficiently implement the computerization have not been devoted to it.

Recently, staff has begun investigating alternative automation systems.

While the trend over the past decade has been toward staffing reductions, maintenance responsibilities at the airports are once again increasing

Over the past ten years, trades position staffing has been reduced from thirty-two positions to twenty-five. Although complete and accurate management information is not available to reliably quantify the increase in responsibilities, a number of factors suggest that it is taking place. In particular:

- Age of the main PBI A facilities. The 560,000 square foot terminal building is now thirteen years old. As facilities age, they typically require more maintenance. From a “curb appeal” perspective, the main PBI A facility appears to be in good condition. However, there are signs that current maintenance efforts may not be addressing all the repair and maintenance needs of the facility. On November 21, 2000, an informal photo inspection was conducted of PBI A by the study consultant and the Building Maintenance Supervisor. The photographs show trip hazards, ceiling and floor tiles in need of replacement, cracks in the structure which will eventually promote water intrusion, a railing in need of immediate repair, water collection in a stairwell and other, more aesthetic, issues. Copies of the subject photographs are included as *Appendix 31*. A visual inspection of each of the three general aviation airports confirms the continuing existence of facility and equipment deterioration described earlier by outside inspectors.
- Additional HVAC equipment installed at PBI A. In 1998, major new equipment systems were added at PBI A which require maintenance by the HVAC unit. The HVAC Supervisor estimates the additional maintenance requirements at approximately ten man-hours per week.
- Added responsibility for the North County Airport. Responsibility for this facility was formerly contracted out, but became a County responsibility in late 2000. Existing staff must absorb this additional responsibility.
- Southwest Airlines. The addition of this airline in January 2001 yields projections of a 10% increase in passenger traffic.
- Added and/or unaddressed maintenance requirements generated from external sources. As shown in Figure 3 on page 13 of this report, only five of 56 items of concern cited in the 1999 Dames & Moore Inspection Report had been completed after more than a year. Fourteen of those items were determined to be beyond routine maintenance and twenty-five others were determined to require immediate action by Dames & Moore’s outside engineers. In addition to the low response rate to the Dames & Moore Inspection Report, no preventive maintenance service has been undertaken in the past twelve months to visual aids equipment as recommended in the FAA’s Advisory Circulars. Finally, the recently-completed inspections by Industrial Risk Insurers recommended increases in the frequency of inspection for fire protection equipment, which the Facilities Superintendent estimates will add approximately 100 man-hours per year, affecting both electricians and plumbers.
- Backlog trends indicated in available records. Although the usefulness of information from the automated maintenance management system is limited, separate workload data maintained by the Building Maintenance unit in the “Terminal Maintenance Projects Report” suggests an increasing trend in the growth of open work orders over the course of

calendar year 2000, and an average 3.3 months behind schedule status of “Priority 1” tasks as of March 2001. No similar information was available for either the HVAC unit or Industrial Electricians unit to substantiate whether there have been corresponding trends/backlogs in those units.

RECOMMENDATIONS

Recommendation 1: It is recommended that the department reevaluate its approach to implementing the automated maintenance management system for the Facilities Section

The approach taken over the past ten years to implement an automated maintenance management system in the Facilities Section has several drawbacks which are a hindrance to the timely and effective completion of that effort. Failure to undertake a structured system application design at the outset of the process was an oversight which will continue to complicate implementation. Department management should insist that before anything further is done with the system, a methodical evaluation be conducted. Specifically, there are considerations which remain relevant even though software and hardware decisions have all been made, viz.:

- What processing objectives does the facilities maintenance program have which it can accomplish only through computerization? What objectives are enhanced through computerization? What objectives has the facilities maintenance program not been able to set for lack of computerization?
- What are the priority objectives for computerization? What are the lesser objectives?
- What source documents will be required for implementation of each computerized application? Do they all presently exist, or will they have to be developed? What affect will development of needed source documents have on the implementation schedule?
- What resources—money, manpower and machinery—are available for the implementation, and what limitations are there on each of these? How should these limitations be overcome? What demands will there be on management time?
- Who are the principal beneficiaries of the computerized applications? What role can/should each of them play in development and implementation of the computerized system?
- What are the consequences of not meeting task milestones or time targets? Will any systems now in use be made unusable as a result of the implementation (or *attempted* implementation) of a computerized approach? Will that matter?
- How will changes in the workplace affect the implementation plan?

- Who has overall responsibility for ensuring successful completion of the effort? Does he or she understand the objectives? Is he/she committed to achieving them?

If such an evaluation concludes that the current software product is not adequate to meet the department's maintenance information and workload management needs, other options should be evaluated against these same criteria.

Recommendation 2: It is recommended that interim standards and procedures be established concerning input of work activity into the existing computerized system to serve until the evaluation in Recommendation 1 above can be completed

GP Mate can track and monitor a great many sorts of data, not all of which are necessary in the short-term to allow the Section to gain control over work prioritization and assignment, backlog monitoring and manpower planning. A relatively few data elements should give the department the information it presently lacks in order to know where its maintenance performance is lagging, and by how much. Identifying the minimum required data fields to track for each type of work is the appropriate place to begin.

Recommendation 3: It is recommended that three maintenance positions be added to the Facilities Section staff roster, effective at mid-year FY 2002

The study team found widespread systems deficiencies in the day-to-day management of the Section's responsibilities. There is no reason to believe that simply doing more of what they have been doing will lead to a different result. These deficiencies must be corrected. Nevertheless, it strikes us that there is now a relatively sustained growth in those responsibilities that will not be overcome without additional staffing, or some alternative strategy, such as outsourcing. The study team has identified three positions which it believes can be effectively used to help overcome specific maintenance slippage:

- One General Maintenance Mechanic in the Building Maintenance Unit. An additional mechanic position should help reverse the trend in open work orders experienced by the unit during the past year, and bring the behind-schedule status of "Priority 1" tasks back under control, by assisting the other trades as needed.
- One Air Conditioning and Refrigeration Specialist II in the HVAC Unit. This position would increase the level of preventive maintenance attention currently provided by the unit (58% of scheduled PM activities), as well as assist with the maintenance of air conditioning systems at the North County Airport.
- One Industrial Electrician in the Industrial Electricians Unit. The majority of preventive maintenance activities outlined in FAA Advisory Circulars are electrical in nature. An additional Industrial Electrician

position is recommended to be assigned specifically to those tasks to ensure that these activities are routinely completed as recommended by the FAA.

By delaying the effective date of the new positions until mid-year, the responsible maintenance managers can first demonstrate that they have made a significant start on carrying out recommendation nos. 1 and 2 above.

IMPLEMENTATION

This final section of the report contains a proposed plan for the implementation of study recommendations. Where appropriate, it also contains an estimate of the costs and benefits associated with the individual recommendations. Some recommendations have cost implications; others result in cost savings. Still others represent opportunities to improve operational effectiveness or enhance service levels. Each recommendation is re-stated in the table below, along with a summary of the estimated costs and/or anticipated service level impacts. The recommendations are listed in the same order as they were discussed earlier in the report.

TABLE 3

Proposed Plan for the Implementation of Study Recommendations

Recommendation	0-3 Months	3-6 Months	6-12 Months	Implementation Responsibility	Comments
1. Reevaluate automated maintenance management system	•	•	•	Operations Manager	ID source documents, available resources, consequences of non-compliance, potential alternatives to existing system.
2. Establish interim standards	•			Operations Manager	ID minimum required data fields; Allows for backlog monitoring and manpower planning.
3. Add one Gen Mtc Mechanic			•	Operations Manager	Improved preventive maintenance; reduce behind-schedule status. Effective mid-year FY 2002. Estimated annual cost: \$30,350.
Add one A/C Specialist II			•	Operations Manager	Improved preventive maintenance. Mid-year FY 2002. Estimated annual cost: \$37,150; contract cost savings: \$12,235.
Add one Indust Electrician			•	Operations Manager	Do FAA preventive maintenance. Mid-year FY 2002. Estimated annual cost: \$38,264. Unknown overtime savings.