WASHINGTON OPERATIONS

PRELIMINARY PROBLEM STATEMENT
CONCERNING
CELL DOOR OPEN/CLOSE STATUS

JANUARY 1974

Equipment Systems Improvement Program Report
prepared for

NILE&CJ

U.S. DEPARTMENT OF JUSTICE
LAW ENFORCEMENT ASSISTANCE ADMINISTRATION
NATIONAL INSTITUTE OF LAW ENFORCEMENT
AND CRIMINAL JUSTICE

MITRE

THE EQUIPMENT SYSTEMS IMPROVEMENT PROGRAM

Following a Congressional mandate* to develop new and improved techniques and equipment to strengthen law enforcement and criminal justice, the National Institute of Law Enforcement and Criminal Justice under the Law Enforcement Assistance Administration of the Department of Justice established the Equipment Systems Improvement Program. The objectives of the Program are to determine the priority needs of the criminal justice community to help in its fight against crime, and to mobilize industry to satisfy these needs. A close working relationship is maintained with operating agencies of the criminal justice community by assigning systems analysts to work directly within the operational departments of police, courts and corrections to conduct studies related to their operational objectives.

This document is a research report from this analytical effort. It is a product of studies performed by systems analysts of the MITRE Corporation, a not-for-profit Federal Contract Research Center retained by the National Institute to assist in the definition of equipment priorities. It is one of a continuing series of reports to support the program decisions of the Institute relative to equipment development, equipment standardization and application guidelines. Comments and recommendations for revision are invited. Suggestions should be addressed to the Director, Advanced Technology Division, National Institute of Law Enforcement and Criminal Justice, Law Enforcement Assistance Administration, U. S. Department of Justice, Washington, D. C. 20530.

Gerald M. Caplan, Director
National Institute of Law
Enforcement and Criminal Justice

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* Section 402(b) of the Omnibus Crime Control and Safe Streets Act of 1968, as amended.

THE MITRE CORPORATION
WASHINGTON OPERATIONS

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EQUIPMENT SYSTEMS IMPROVEMENT PROGRAM

PRELIMINARY PROBLEM STATEMENT CONCERNING CELL DOOR OPEN/CLOSE STATUS

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Approved for Project Distribution William E. Holden

William E. Holden

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FOREWORD

Following a Congesssional Mandate* to develop new and improved techniques, systems, and equipment to strengthen law enforcement and criminal justice, the National Institute of Law Enforcement and Criminal Justice (NILECJ) established the Equipment System Improvement Program (ESIP) comprised of an Analysis Group, a Development Group, and a Standards and Guidelines Group. The function of the Analysis Group is to establish groups of operational analysts to conduct system studies related to the operations of community police, court, and correctional agencies. Some of the groups were assigned to work within specific law enforcement and criminal justice agencies selected by NILECJ. The remainder were assigned to a headquarters staff concerned with national level analyses.

This document is a research report of the Analysis Group. It is a product of the studies performed by the analysts of The MITRE Corporation and is one of a continuing series that supports the program decisions of NILECJ relative to equipment development, equipment standardization and application guidelines. Comments and recommendations for revision are invited. Suggestions should be addressed to the Program Manager for Analysis, National Institute of Law Enforcement and Criminal Justice, Law Enforcement Assistance Administration, U.S. Department of Justice, Washington, D.C., 20530.

* Section 402(b) of the Omnibus Crime Control and Safe Streets Act of 1968, as amended.

ACKNOWLEDGMENTS

This report was prepared by the Criminal Justice Analysis Department of The MITRE Corporation under the direction of Mr. William E. Holden. The technical research and writing were done by Mr. Kerry Levin of the Washington Operation based on problems submitted by Mr. Arthur Distler and Dr. Mark Spahn of the Illinois Correctional Site of The MITRE Corporation.

SUMMARY

This Preliminary Problem Statement addresses the problem of the correctional officer's inability to determine the status of each cell door under his control from a remote location. This is a problem at most older, male maximum security institutions in the United States. The lack of cell door status information generally results in the following problems:

- increased inmate-officer tension,
- reduced officer morale due to lack of confidence in locking systems,
- increased locking system repair, and
- increased officer workload (2 hours per day) to manually check all cell doors.

The cost to replace an existing locking system with one having cell door status capability is high, (e.g., more than $500 per cell).

The following factors are considered to be critical in providing a cell door status indicator capability to an existing institution's locking system:

Cost - under $100 per cell door (preferably no more than $20 per cell door),

Reliability - less than one false cell door status indication per week for a group of 50 cells (i.e., Mean-Time-Between-False-Indication (MTBFI) $\geq$ 1 year per cell door unit), and

Installation - the cell door status indicators must be adapted to existing locking systems without degrading the locking system performance.

I. STATEMENT OF PROBLEM

Due to the design and size of the cellhouses at most older correctional institutions, it is impossible for correctional officers positioned at the ends of the cellhouses, where the locking system remote controls are generally located, to determine whether or not all the cell doors under their control are closed and locked. There is no existing way of economically adding a cell door open/close indicator capability to an existing mechanical locking system.

This is a problem at many older maximum security institutions (and probably some of the larger jails). Some locking systems (e.g., Folger Adams Type A Gang Locking Device) require that all the cell doors be closed before remotely locking all the doors in a particular area. Many cell door locking mechanisms are damaged by the activation of the remote locking system when some of the doors remain open. This problem is aggravated by the lack of remote indications of cell door status.

When the open/close, locked/unlocked status of all doors is unknown, correctional officers (usually in groups of two or three) must manually check the status of each cell. In large cell blocks, this can require a minimum of two hours per day.

Major security problems can arise when cell doors that are assumed to be closed, are open. The safety of a guard and the security of an entire prison can be endangered if a prisoner from an unlocked cell overpowers a guard and uses the guard's master key to let other prisoners out. Besides the obvious security problems that can arise, the lack of knowledge of cell door status, accompanied by recurring locking system failures, causes the correctional officers to lose confidence in the locking system. This can increase the tension between officers and inmates and thus result in increased repressive restrictions on the inmates, e.g., continuing lock-ups.

II. REFERENCE DOCUMENTS

1. PIR #19, "Inadequate Cellhouse Locking System," submitted 24 July 1973 By A. S. Distler and M. J. Spahn, MITRE Field Site Representatives (FSR) at the Illinois Department of Corrections, St. Charles, Illinois.

2. PIR #80, "Inability to Determine Cell Door Open/Close Status," submitted 27 August 1973 by A. S. Distler and M. J. Spahn, MITRE FSRs at Illinois Department of Corrections, St. Charles, Illinois.

3. Prison Locks, Locking Devices and Prison Equipment, by the Folger Adam Company, Equipment Catalog, 1973.

III. PROBLEM SIGNIFICANCE/ASSESSMENT

The lack of knowledge of cell door open/close status has been indicated as a problem by the MITRE Field Site Representatives with the Illinois Department of Corrections. In order to determine the national scope of this problem, the following correctional institution representatives, most of whom are responsible for facilities development and security, were contacted:

- Mr. Thomas L. Smithson, Chief of Facilities Planning, California Department of Corrections, Sacramento, California
- Mr. Hunter Jackson, Assistant Director of Security, Virginia Department of Corrections, Richmond, Virginia
- Mr. William Patrick, Staff of Facilities Development, Federal Bureau of Prisons, Washington, D. C.
- Mr. Norman Gervais, Chief Construction Coordinator, New York State Department of Correctional Services, Albany, New York
- Mr. Ronald Marks, Chief of Facilities Planning, Pennsylvania Department of Corrections, Harrisburg, Pennsylvania
- Mr. Mitchell, Locksmith, United States Penitentiary at Marion, Illinois
- Mr. Carl Tiller, Correctional Officer Training, Illinois Department of Corrections, Menard Penitentiary, Chester, Illinois.

QUALITATIVE

This problem manifests itself in at least four ways: increased officer workload (manually checking the status of cell doors), increased locking system repair, reduced institution security and officer confidence in the locking system, and increased capital expense to replace existing obsolete locking systems.

Every source contacted indicated that the lack of knowledge of cell door status can be a problem at most older, male maximum security institutions. At least sixty percent of the cell blocks in male maximum security institutions are at least twenty-five years

old with correspondingly old locking systems. Most of the referenced gentlemen stated that an effective locking system was vital to the security of a maximum security prison. Not knowing the open/close, locked/unlocked status of cell doors significantly reduces a locking system's effectiveness.

. Many of the inmate attacks on officers are a result of the officers not knowing the status of particular cell doors and mistakingly entering what they thought was a secure area.

. Lack of officer confidence (reduced officer morale) results when cell door status is unknown especially when the locking system is subject to recurring failures.

QUANTITATIVE

. At least 20% of all locking systems repair problems in the Stateville, Illinois, prison result from officers prematurely attempting to lock the cell doors from a remote location before all the doors are closed.

. At those institutions where confidence in the cellhouse locking system is low (primarily due to recurring locking system failures), extra time must be spent by officers verifying that cell doors are locked. For example, at Stateville Prison on any given day up to five, ten and at times, an entire half gallery of cells (29 cells) will fail to lock when the system is locked from a remote location. In large cell blocks (200 to 500 cells), two or three officers can spend two to three hours each, per day, checking the status of cell doors. This is especially true when there is regular movement of large numbers of inmates (50 to 100 inmates) in and out of the cell block. Of course, all the cells must be double checked in the evening when all inmates are locked up.

. Providing a cell door status indicator retrofit can save a correctional institution significant amounts of money. To obtain a cell door status capability generally requires the complete replacement of the existing locking system with a new mechanical or electrical locking system at a cost of $500 to $1,500 per cell. Stateville Prison near Chicago was quoted (by the Folger Adam Lock Company) 2.5 million dollars to replace their existing hydraulic locking system with a new mechanical/electrical system having the cell door status capability. About five years ago, the New York State Correctional Services Department received a quote of approximately $700 per cell (for a 500 cell institution) to replace an existing out-dated locking system with a modern one.

IV. PRESENT SITUATION

EXISTING OPERATIONS

Equipment Operation

Although there are variations among the institutions, and even among different cellhouses within a given institution, cellhouse locking systems are essentially similar in operation (when they are working properly) and contain the following elements:

. Each cell has its own independent key-operated deadbolt lock.

. In addition, each cell has a lock which is remotely controlled, one-cell block area at a time, to the following extent:

Open: When the system is on open, all cells in a particular area are unlocked (providing the independent deadbolt described immediately above is unlocked) and cannot be locked with a key.

Key-Lock: When the system is in the key-lock position, each cell in the area can individually be unlocked with a key (again, providing the independent deadbolt is unlocked) and, if the cell door is open, it can only be moved so as to close it.

Dead-Lock: In this position, all cells in the area whose doors are closed are locked and cannot be opened with a key. Some systems cannot be put on dead-lock without risk of damage if any of the cell doors in the area are open.

Operational Procedures

The remote controls for a particular cell block area are usually located at the end of that rectangular cell block. There are usually about 25 cells under the control of each set of cell block controls. The use of the cellhouse locking system remote controls is as follows: The dead-lock position is used primarily in the evening when there is no movement of inmates into or out of their cells. During the day, under normal operations, the position of the remote controls is set to key-lock. Then, if only a small number of inmates are involved, these inmates are usually individually keyed into or out of their cells.

For movements of large groups of inmates (for example, to and from mess, assignments, or yard detail), the procedures vary according to the institution in question. At some institutions, the remote controls are left on the key-lock position and each inmate is individually keyed into and out of his cell by a guard, just as in the movement of small groups of inmates. At other institutions, the remote controls are set to the open position, one area (block) at a time, at which time the inmates open their cell doors and leave the cells. Then the remote controls are set to the key-lock position and each inmate closes, and therefore locks his cell door behind him, and all the inmates leave the cellhouse. Upon the return of large groups of inmates, the remote controls are set to open at some institutions so that the inmates can enter their cells themselves; at other institutions, the inmates are individually keyed in by an officer. It is interesting to note that at the Stateville institution the use of the open position for the movement of large groups of inmates has been replaced by individually keying inmates into and out of their cells. Since this changeover has taken place, a marked reduction of incidents (inmate attacks on officers and other inmates) has been observed.

Under an institution-wide lockup condition, such as is presently in force at the Stateville institution, the use of the remote controls is greatly restricted. Under such a condition, there are no assignments, no yard detail, and no general mess detail. Inmates are individually keyed into and out of the cells, one-half gallery (29 cells) at a time, for meals. They pick up their meals in the cellhouse and bring them back to their cells.

Equipment and Equipment Related

At least four levels of cellhouse locking systems exist and are briefly described as follows (all cells have independent-keyed deadbolt locks):

- No Remote Cell Door Lock Controls (most jails and smaller prisons)[1]
  - guards use keys to open and close individual cells.
  - no cell door open/close, locked/unlocked indicators.

[1]Many of the older, male, maximum security institutions' cell block locking systems are of this type.

- Mechanical Remote Cell Door Lock Controls (most older institutions)
  - can only remotely lock or unlock all cell doors at one time.
  - inmates open and close cell doors when unlocked.
  - cell door open/close, lock/unlock indicators
    - none (most older institutions, most Illinois institutions).[2]
    - mechanical indicators (metal tabs in various positions to indicate door status - some California institutions).
    - visual indicators (some Virginia institutions use a luminescent stripe on edge of hinged cell door facing guard stand).
- Mechanical/Electrical Remote Cell Door Lock Controls
  - no individual cell door remote controls (can only unlock groups of cells).
  - electrical cell door open/close, locked/unlocked indicator lights (California; New York; Pennsylvania; Marion, Illinois Federal Prison and others).
  - inmates must open and close the doors when unlocked.
- Mechanical/Electrical Remote Cell Lock and Door Controls
  - electrical cell door open/close, locked/unlocked indicator lights.
  - individual and block cell lock and door remote controls (can lock or unlock individual and groups of cell doors and can open and close those cell doors - Marion, Illinois Federal Prison and some Pennsylvania institutions).
  - inmates cannot open and close doors when unlocked.

At least sixty percent of cell blocks now in use are at least twenty-five years old. The major locking system problem at these institutions, besides replacing worn out locks (the 2000 locks in the Graterford Prison near Philadelphia are being replaced because they have worn out), is knowing the status of each cell door.

[2]Many of the older, male, maximum security institutions' cell block locking systems are of this type.

CONSTRAINTS BEARING ON THE APPROACHES TO PROBLEM RESOLUTION

Cost is the major constraint bearing on any resolution to this problem. Most institutions do not have the funds for the complete replacement of their existing locking systems in order to obtain a cell door status capability. The funds available for modifications or improvements to existing locking systems are also limited.

Any cell door status indicator system must be easily used, maintained and repaired by correctional staff of varying levels of ability. The system must be completely inaccessible to inmates who may be required to install it.

Any cell door status indicator system must be adaptable (retrofittable) to most existing locking systems without adversely affecting the performance of those locking systems.

IDEAL OPERATION

All of the recent correctional task forces[3] recommend the reduction of the size of institutions and cell block areas so that correctional officers can get to know and regulate the actions of the inmates under their jurisdiction without the need for elaborate security equipment (surveillance equipment and repressive locking system hardware).

In the existing, male, maximum security institutions, where these Correctional Task Force goals cannot currently be realized, the following would be an acceptable locking system:

A cellhouse locking system should allow for the:

- remote locking and unlocking of all the cell doors at one time,
- remote locking and unlocking of individual cell doors,

[3] 1967 Presitent's Commission on Law Enforcement and Administration of Justice. 1973 Task Force Report on Corrections by the National Advisory Commission on Criminal Justice Standards and Goals.

- positive indications of cell door status (open/close, locked/unlocked[4]) at the remote control panel and visible throughout the cell block area,
- audio indication that a cell door is not operating as required.

Also:

- the system should require minimum and simple maintenance and repair;
- the system should not be vulnerable to inmate sabotage, and
- inmates should have some capability to lock their cells, to protect their valuables from pilferage and themselves from attack.

[4] There should be one indicator for open/close status and another indicator for locked/unlocked status. Using lights for the indicators would require both lights on when the cell doors were closed and locked.

V. ALTERNATIVES

DEFINITION OF ALTERNATIVES

The following is a list of some possible alternatives for improving the monitoring of cell door status:

Alternative 1

Increase the number of correctional officers monitoring a particular cell block area so that each officer has only a few cells (inmates) to monitor.

Alternative 2

In rectangular cell blocks having hinged cell doors, have all the cell doors open in one direction so that the unhinged edge of each door faces an officer's post. Apply some type of luminescent paint to that edge so that this paint will be visible to the officer if a cell door is not closed when required to be closed.

Alternative 3

Retrofit a cell door open/close, locked/unlocked indicator capability to an existing cellhouse locking system without having to dismantle or replace the existing locking system.

Alternative 4

Replace existing, antiquated locking systems by new locking systems that satisfy the requirements defined for the ideal system (see Subsection "Ideal Operation," page 8).

ANALYSIS OF ALTERNATIVES

Alternative 1

It would be most desirable to increase the number of competent correctional officers to monitor cell block areas. However, correctional institutions find it difficult to attract competent personnel (or any custodial personnel) to fill existing positions, much less any new positions. The remuneration for prison custodial positions is generally meager and funds do not exist to significantly reduce the inmate to corrections officer ratio. This would be an expensive solution.

Alternative 2

This appears to be a quick and inexpensive solution to this problem if inmates can be prevented from sabotaging (defeating) the door edge paints by covering the paints with dirt or scraping the paint off. But, since most institutions utilize sliding cell doors instead of hinged ones, these institutions will not find this alternative useful.

Alternative 3

This could be an effective solution if an inexpensive method can be developed to add a cell door open/close, locked/unlocked indicator capability to the existing locking systems.

Alternative 4

This alternative is a very expensive solution to the cell door status problem. At a cost of $500 to $1500 per cell, most states will find this solution prohibitive unless they have already allocated funds to build a new maximum security institution or to replace their existing locking systems.

BEST ALTERNATIVES

Alternatives 1, 2 and 3 would have no effect on the performance of an existing locking system, but would improve the security of the institutions because officers would no longer be surprised when the locking system did not operate as desired.

Alternatives 2 and 3 should be considered as the most cost-effective approaches to resolving the cell door status problem of the older, maximum security correctional institutions. Alternative 2 will be of limited use in institutions with sliding cell doors.

VI. GENERAL REQUIREMENTS

DEFINITION OF CRITICAL OPERATIONAL PARAMETERS

Cost

The dollar amount that is required to provide an individual cell door with a remote cell door status (open/closed, locked/unlocked) indicator. The cost of installing the cell door status indicator system (if contractor required) and the cost of cell door sensors, wiring (if necessary) and remote cell door status indicator panels and lights must be factored into the cost.

- Dollars/cell

False Indication

A false cell door status indication can occur in any of the ways defined in the following matrix of cell door and indicator status:

F - False Status
T - True Status

Actual Cell Door Status	INDICATED STATUS: Open & Unlocked	Open & Locked	Closed & Unlocked	Closed & Locked
Open & Unlocked	T	F	F	F
Open & Locked	F	T	F	F
Closed & Unlocked	F	F	T	F
Closed & Locked	F	F	F	T

- false indications per/day

Mean-Time Between-False-Indications (MTBFI)

The average time between false cell door status indications for each cell door.

- days

ANALYSIS OF OPERATIONAL PARAMETERS

Cost

The cost for any cell door status indicator must be low, costing no more than $100 per cell and preferably about $20 per cell. Cost

is the most important factor related to the cell door status indicator problem because most institutions cannot afford to replace their existing locking system with a new one having the cell door status capability.

False Indication

With regards to institutional security, the following false indications are the more serious of the possible cell door status indicator failures:

- cell door is "Open & Unlocked" - indicator shows door "Closed & Locked"
- cell door is "Closed & Unlocked" - indicator shows door "Closed & Locked."

The following false indication could result in damage to the locking mechanism if the cell door is remotely locked while it remains open:

- cell door is "Open & Unlocked" - indicator shows door "Closed & Unlocked."

There are no quantitative data available to define what level of false cell door status indications would be tolerated. The MITRE Field Site Representatives believe that a correctional officer monitoring fifty cells would not tolerate more than one false cell door status indication per week for all the fifty cells.

MTBFI

Ideally no false indications should be tolerated. No information is available to define the level of false indications that would be tolerated by a correctional officer. The MITRE Field Site Representatives with the Illinois Department of Corrections estimate that no more than one false indication per week per fifty cells would be acceptable. In order to have no more than one false indication per week for the cells monitored by one officer (about fifty cells), the MTBFI for a particular cell door indicator capability would have to be at least:

$$\frac{50 \text{ cells}}{1/7 \text{ days}} = 350 \text{ days} = \text{MTBFI}$$

Reliability (MTBFI) is second only to cost in importance. Due to the recurring locking system failures, it is vital for correctional officers to be continually cognizant of the status of all cell doors.

OPERATIONAL REQUIREMENTS

. Positive remote indication of open/close, locked/unlocked status of each cell should be provided.

. The cell door indicators for a particular area should be visible from any point in that area.

. The cell door indicators should be configured and numbered in a manner that simulates the arrangement of the cell doors.

. When all cell doors in a particular area are set in the dead-lock configuration (e.g., a lock-up or during evening hours), an audio alarm should be triggered upon unauthorized tampering with a cell door or lock. The appropriate cell door indicator should be distinguishable during this situation.

. The system (the cell door status indicator system shall be referred to as "the system") must be able to be retrofitted to most existing cellhouse locking systems and be made an integral part of any new locking system.

. It must be quickly and easily installed with minimal disruption of the normal routine.

. The cell door sensors should be wireless. If they cannot be wireless, then the wiring should be installable by prison labor and the wires and sensors should be protected against tampering by an alarm.

. The sensors in the cell doors and locks shall be inaccessible to inmates and shall not be capable of being mechanically or electrically affected by inmates.

. The sensors and cell door status indicators shall be easily maintainable and repairable. The components shall be modularized for easy maintenance, repair and replacement.

. A verification procedure (either manually initiated and/or system initiated) should be included to determine the performance of the cell door sensors, indicators and alarms.

. The system must in no way degrade the performance of the existing locking system.

. The system must be inexpensive, costing no more than $100 per cell and preferable no more than $20 per cell.

. The MTBFI for an individual cell status indicator unit should be at least one year for the group of cells normally monitored by one officer (fifty cells) to achieve a maximum of one false indication per week.

END