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TECHNICAL REPORT NO. 69-14

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RIOT CONTROL: ANALYSIS AND CATALOG

Final Report

By

David W. Samuels
Donald O. Egner
Donald Campbell
Research Analysis Branch

October 1969

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ABSTRACT

This report attempts to provide a systematic analysis of some types of civil disturbances and a survey of related developmental materiel. The major limitation of the analysis is its restriction to "ghetto"-type riots, necessitated by limitations in time and available information. However, the materiel items described are universal in application to various forms of civil disturbances. The first part of the report analyzes such riots by identifying common characteristics of a number of disturbances which have occurred in the United States and describing the experiences of various security forces in their control. The latter part of the report serves as a catalog of materiel items, not already in the Army inventory, which may be useful in providing a more flexible response to the special requirements of riot control.

FOREWORD

This report has been prepared by the Research Analysis Branch, Special Activities Division, U. S. Army Limited War Laboratory. Substantial technical support was provided by the Cultural Information Analysis Center, Center for Research in Social Systems, American University; the Remote Area Conflict Information Center, Battelle Memorial Institute; and Booz-Allen Applied Research, Inc.

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INTRODUCTION

In the spring of 1968, the USALWL held a "brain-storming" session among its technical personnel concerning the problem of hardware development for riot control situations. At that time little organized factual information was available concerning the characteristics of civil disturbances and key problem areas associated with the maintenance of law and order. Consequently, there were few objective criteria for evaluation of proposed concepts. Nevertheless, a "catalog" of 86 suggested items was put together, along with a crude ordering into general problem areas. This subsequently was published by Office, Chief of Research and Development, Department of the Army in August 1968 under the title, "Catalog of Selected Items to Aid in Controlling Civil Disturbances."

Immediately after this first effort, the USALWL set up a program to further define the problem and to investigate both state-of-the-art equipment and new concepts in order that the original "catalog" could be revised and made into a more meaningful document. Three studies, each performed by a different research group were established to meet the program objectives. These were:

a. Identification and definition of the basic problems and characteristics associated with the prevention and control of civil disturbances. (Work was done by Cultural Information Analysis Center (CINFAC) of the Center for Research in Social Systems (CRESS) at the American University. This work is reported in CRESS Sci Info Resp No. 2014, Jan 1969.)

b. Determination of state-of-the-art hardware systems and concepts presently available for application to riot control problems. (Work was done by the Remote Area Conflict Information Center (RACIC), Battelle Memorial Institute. The results of this effort are published in RACIC Final Report R-2297, Jan 1969.)

c. Investigation of new developments in technology to uncover promising new concepts, devices, and techniques for civil disturbance application. (Work was done by Booz-Allen Applied Research, Inc. A report of this study is currently in draft form.)

The work of the three research teams was reviewed at a coordination meeting held at the USALWL in December 1968. In addition, the thoughts and comments of selected personnel from the following interested organizations were solicited at that time: Office of the Chief of Research and Development, US Army Materiel Command, US Continental Army Command, US Army CDC Military Police Agency, US Department of Justice, Federal Bureau of Investigation, Institute for Defense Analysis, American University, Battelle Memorial Institute, Booz-Allen Applied Research, Inc., and the USALWL.

This report, which utilizes the results of the above three studies, provides an updated study and "catalog" of development materiel for use in civil disturbances. It represents an attempt to provide a systematic analysis of problem areas and related materiel items. The report does not consider any items which are currently in the Army inventory. The limitations and deficiencies of this new work are recognized. The major limitation of this study is its

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consideration only of the ghetto-type riot, this limitation being imposed by available time for study. However, the materiel items are universal in their applications and may be applied to various forms of civil disturbances both within CONUS and overseas. It is offered as an improvement over the original "catalog," in addition to the study effort, and reflects the latest efforts of the USALWL in the riot control problem area.

The report is organized as follows:

a. Part I, "Problem Description and Background Information," is essentially a summary of the CINFAC/CRESS report previously referenced.

b. Part II, "Operational Problems," is a defined list of problems which security forces may be expected to encounter. The problems are expressed as missions. One of the more difficult efforts of this task has been the construction and definition of the list of missions since the mission statements must be comprehensive enough to cover every aspect of civil disturbance and yet definite enough to suggest specific materiel solutions.

c. Part III, "Catalog of Materiel," provides descriptions of development equipment and indications of their applicability to specific problems and their availability. A key element of this section is the chart which cross-references the operational problems defined in Part II against specific solutions, thereby serving as an index.

d. Part IV, "Appendices," includes a description of the Department of the Army ENSURE program which provides a means for applicable CONUS Army subordinate commands and agencies to obtain the non-standardized materiel items listed in this catalog. Normal procurement procedures should be employed to obtain type-classified items already in the Army inventory and which are thought to be useful in a riot control function.

PART IPROBLEM DESCRIPTION AND BACKGROUND INFORMATION1. Introduction

There is no typical disorder in terms of intensity of violence and extensiveness of damages. In spite of the extreme disorders that occurred in Harlem, Watts, Hough, and Detroit, the majority of civil disturbances are of short duration, involve small numbers of participants, and result in few arrests and little property damage.

In the community context, the interactions of the following elements shape the course and character of a civil disorder:

- a. militants
- b. potential rioters
- c. the internal security forces
- d. the general population of the community.

In developing a theory to account for the origin and character of hostile outbursts, the following overlapping conditions must be considered in the social situation:

- a. Dissidents must perceive that a crisis exists and must assign responsibility for the crisis to an agency, group, or individual.
- b. Associational groups accentuate cleavages within the larger community by reinforcing through verbal interaction a hostile system of attitudes and beliefs.
- c. Many of the dissidents are motivated by a belief that the existing institutional mechanisms are inadequate to solve their problems.
- d. Potential rioters must be able to communicate and get in close contact with one another.
- e. There must exist an expectation that violence will be rewarded in some manner.
- f. There must be facilities for violence and the development among the discontented of a quasi-political ideology that sanctions collective disorder as a legitimate form of protest.

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2. Phases of Civil Disorder

The complex interaction among the various segments of society determines the form that conflict will assume. Depending upon the values of the general community, the belief system of dissident groups, and the posture of control forces, discontent may be quiescent, assume the form of a riot, or develop into a subversive underground movement.

Understanding the life-cycle of civil disturbances is a prerequisite for the employment of effective countermeasures. Countermeasures which may be fruitful at one phase of the life-cycle of civil disturbances may be counterproductive at another. If improperly employed, they may have a "booster" effect which contributes to an escalation in the level of violence. CINFAC has categorized four such phases of civil disorder, as follows:

Pre-mobilization phase
Mobilization phase
Hostile outburst phase
Post-hostility phase

While no two civil disturbances are exactly alike, characteristics of the dissident groups, weapon systems, and the riot control forces are distinctive for each phase.

a. Pre-Mobilization Phase. This phase encompasses the period of time when cleavages occur in society as a result of the growth of beliefs that are hostile to the established order. Cleavages arising from hostile beliefs may have an embryonic period of a few years or several scores of years. A distinguishing feature of this phase is the emergence of militant leaders and of dissident groups.

Regardless of how they view riots, most blacks feel that the established social system relegates them to an inferior status. Inner city residents display particular animosity toward the police, who are seen as the chief enforcers of the unjust social conditions.

Because of the numerous variables involved, it is not possible to predict in absolute terms the time, the form, and the magnitude of a civil disturbance. However, law enforcement officers who understand the basis of human behavior that leads to civil disturbance will recognize the following signs as indicators of mounting ghetto tensions: a deterioration in police-community relations, including the occurrence of tension-heightening incidents that involve the police and neighborhood residents; rumors of a particularly threatening form; increased signs of racial friction in the schools; a dramatic rise in the crime level, including mysterious thefts of arms and ammunition; an increase in the size and number of demagogic groups and individuals; the appearance of handbills and other communication devices urging violence; a more casual use of hostile slogans and phrases by residents of the neighborhood; the appearance of a campaign of arson and personal threat that is designed to intimidate white merchants; and incidents of sniping against police.

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b. Mobilization Phase. The mobilization phase is the period of time when crowds form as a result of a precipitating incident that sharpens and focuses the hostility of the aggrieved population. This phase may last a few hours or even a few days. For analytical purposes it may be subdivided into the following components:

- (1) the precipitating event
- (2) the transmission of rumors
- (3) the crowd formation
- (4) the "milling" of crowds.

Because of the growth of beliefs that are hostile to the established order, a segment of the black community is susceptible to strong emotional arousal and violent protest. Under these conditions an emotion-laden incident may serve as a stimulus to lowering inhibitions and intensifying aggression. Studies of recent civil disorders indicate that the immediate precipitants have been emotionally based and evidently have not been related to the basic social injustices. Although to the outsider these incidents may seem to be minor, or even trivial, and may in the past have occurred in the same community without evoking violence, symbolically they reflect deeply shared grievances among segments of the ghetto residents.

For a riot to occur there must be crowds. For crowds to become aggressive there must be communication about some event that heightens tension and furnishes excuses for hostile behavior. Frequently, though not always, the immediate cause of a riot is an inflammatory rumor.

A precipitating event leads to the convergence of numbers of people at the scene of the event. They come for different reasons - curiosity, sympathy, chance arrival at scene as they pass through, to exploit the situation, to pacify the crowd, etc.

In contrast with the situation in which a crowd spontaneously gathers after an incident, a precipitating incident may occur in the midst of an already gathered group of people. Under the proper conditions, a peaceful crowd can erupt into violence or panic.

"Milling" is the term that frequently is used to describe the verbal interactions that occur within a crowd. It is the process of informal communication during which individuals in a crowd learn that they share common resentments and grievances. Through the milling process the crowd excites itself more and more. The result is a spiral stimulation. One excited individual stimulates excitement in another who in turn stimulates a third, who may in turn restimulate the first individual to an even higher pitch of excitement. In this way, anger, resentment, hatred and revenge mount higher and enter into more and more of the personalities of the combatants, consuming all their energies to the point of either exhaustion or destruction.

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Before deciding what action to take against a crowd, internal security forces should first determine whether a crowd is potentially riotous. Crowds regularly form in the ghetto in response to an exciting or unusual event. Rough handling of a casual crowd by security forces can bring to the fore submerged hostilities, transforming a passive crowd into a mob. Indicators must therefore be established for determining the disposition of a crowd. Some of the considerations might be: events leading to the formation of the crowd; recent history of transmitted rumors; opinions, and sentiments; evidence of hostile groups on the edge of the crowd scene; and capabilities of agitated elements.

c. Hostile Outburst Phase. This is the period of time when groups of individuals commit serious breaches of peace. A major problem facing the control forces during this phase is to distinguish between lawbreakers and innocent people in the riot area. Virtually every major riot has its toll of innocent people who are wounded and killed because of curiosity or chance. The introduction of more advanced nonlethal weapons can provide riot control forces with a greater flexibility of responses and, at the same time, lead to a reduction in the toll of casualties.

Riots provide different kinds of ghetto dwellers with various opportunities to pursue highly varied goals. The longer a riot persists, the easier it is for individuals to become participants and the more varied are the goals pursued.

The initial stage of crowd behavior evidences a rudimentary division of labor. It involves an active core of participants and a rather passive group of people who just stand around watching from the sidelines. This is a critical time for the internal security forces. They must re-establish law and order with a minimal discomfort or injury to the passive members of the crowd. If the riot control forces are unable to restore order, certain portions of the passive audience will become active, as deviant behavior tends to become the norm.

Once various sections of the crowd develop a course of deviant action, the second stage of violence is reached. The crowd begins to establish its own definitions of right and wrong. From the viewpoint of the crowd that the police antagonize or harass them, emerges the norm that it is right for them to teach the police a lesson by burning city-owned automobiles and equipment. From the viewpoint, that white merchants exploit the Negro, emerges the norm that it is right for blacks to receive compensation for injustices by looting the shops of businessmen. In this second stage of rioting, looting becomes the primary goal, although racial dimensions persist. The more daring looters ransack stores not only for their own profit but also for the benefit of the more timid members of the crowd who still hang back on the sidelines.

If the control forces are still unable to restore order, bystanders are swept along in a tide of "we feeling." This third and final stage is marked by an establishment of new property rights. At this stage, looting attains a degree of legitimacy among considerable numbers of the ghetto community. Looting becomes a collective activity as strangers, families, and friendship groups methodically work together. "Big ticket" items become the most sought

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after prizes as participants openly cart away television sets, refrigerators, and furniture.

Even at this ultimate stage people pursue varied goals and participate at different levels. The activists focus their activities upon fighting the police, obstructing firemen, setting stores on fire, and even sniping. There are others who help themselves to merchandise in stores that already have been broken into. Still others mill about the streets, jeering the police and firemen. Finally, there are those who are just curious observers at the riot scene or who are going about their daily work activities.

No matter how irrational and random collective violence appears, crowd behavior is limited by in-group norms and by the agencies of social control. Even when the agencies of social control break down and the rioters enjoy temporary immunity from punishment, in-group norms set limits on the types and form of violence. Violence is primarily directed against the police, police equipment, and white-owned stores, which are the symbols of the rioters' resentments and hostility. On the other hand, rioters usually have spared private houses, churches, schools, libraries, post offices, and other public buildings.

Studies of high-intensity riots in various cities indicate that only ten to fifteen percent of the Negro community participated in or otherwise supported the disorders. Most ghetto residents disapprove of rioting as a form of protest and think of looting, burning, and shooting as crimes.

d. Post-Hostile Outburst Phase. This phase begins when the control forces have ended collective violence. Rioting has ceased at this time, but precautionary measures are still in effect and court action is being initiated. This phase may be subdivided into an immediate and a derived stage. The immediate stage concerns the practical measures associated with the restoration of law and order while the derived stage concerns a longer range period when measures are taken to eliminate the conditions that lead to the eruption of violence.

3. Countermeasures

a. Pre-Mobilization Phase

(1) Social, Economic, and Political

Preventing hostile outbursts will require a program of action that alleviates the conditions of strain, dispels hostile beliefs, and reduces the facilities for violence. Improving the quality, performance, and techniques of police departments is an important part of such a program. In a democratic society, however, force alone is not a sufficient deterrent against violence. A truly effective program will have to attack the basic social, political, and economic ills that underlie the unrest.

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One contributing factor to hostile outbursts is the belief that a crisis exists because of the indifference of local government. Thus, the local government must make itself more responsive to the needs of inner city residents through action programs in areas of housing, welfare, education, and employment. Most of the suggested programs reflect careful thinking, but improvement is needed. Whatever the scope of the program, social scientists caution against extravagant promises that can only result in a more acute sense of deprivation.

Other factors that contribute to hostility are sources of strain that aggravate the cleavages in the social situation. Certain black militant organizations, for example, have accentuated the cleavages between deprived ghettoites and the rest of the community through preaching hate, violence, and separatism. If local civic groups receive widespread support and recognition by the community, they may be in a better position to influence aggrieved ghettoites and, thereby, offer alternative courses of action to riots.

Hostile outbursts are not likely to occur unless most dissidents believe that the existing institutional mechanisms are unresponsive to their problems. Measures to enhance confidence in the existing institutional mechanisms might include the establishment of complaint boards, distribution of appropriate literature, and sometimes provision of legal counsel, which explains to the citizen his rights and obligations in business transactions as well as the legal procedures of small claims courts.

The ability of people who have similar grievances to get rapidly in close contact with each other is another condition for a riot. More recreational facilities and full and part-time jobs would seem to be a partial antidote.

Also contributing to the likelihood of a hostile outburst is the expectation that violence will be rewarded. With some justification, militants have asserted that the recent rioting has served to illustrate dramatically the needs and problems of the deprived ghettoites.

Finally, for a riot to occur there must be facilities for violence and a diminution in the effectiveness of the institutions of social control. Authorities contend that a criminal subculture is flourishing in the ghettos partly as a result of deficiencies in the police court, and penal systems. Police chiefs are taking steps to improve the quality, techniques, and performance of their departments. Legal experts stress the importance of modern courtroom practices.

(2) Law Enforcement

Preventing civil disorders is preferable to suppressing them. In the pre-mobilization phase, critical police functions include enforcing the law each day in such a way that public confidence and respect is maintained and developing plans to cope with emergencies such as civil disorders.

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The policeman in the ghetto is the most visible symbol of a society from which many Negroes are alienated. At the same time the need for policemen is greater in the ghetto than in other parts of the community because of the ineffectiveness of the other institutions of social control. City administrators and police chiefs agree that new and creative approaches are required to earn the support of the ghetto community for effective law enforcement.

Several major riots and scores of minor ones have been precipitated by police shootings. These incidents have occurred in attempts to apprehend a fleeing subject or to subdue a recalcitrant individual. For many of these situations, the standard police weapons - the revolver and nightstick - were inappropriate.

Some of the riots might never have occurred if the police had had a wider choice of weapons at their immediate disposal. Perhaps future disorders could be averted by supplementing the standard police weapons with middle-range ones that are humane and revocable in their effects. In addition to providing police officers with added dimensions of force, middle-level weaponry might also dampen the spiraling arms race occurring between the police and segments of the ghetto community.

(3) Planning

Conditions for civil disorder are present in virtually all cities. The pre-mobilization period is the time when the authorities develop plans of action to cope with emergencies such as civil disorders. Civil disturbance plans must be flexible and applicable to both small incidents and major disorders.

Good intelligence is necessary for effective planning and for assisting in determining the nature and location of potential disorders. Many city police departments assign trained personnel, operating overtly and covertly, on a full-time basis of these duties. Official studies have cited three critical areas in which there is a particular need for improving intelligence operations. First, the police must identify militants, known troublemakers, and other anti-social elements who would be quick to join in and aggravate a potential disorder. Second, the police must identify and maintain communications with the dissident elements of the community. Third, the authorities must maintain communications with the dependable segment of the ghetto community.

b. Mobilization Phase

The character of crowd formation and behavior provides the basis for developing an effective set of principles for controlling agitated groups. Earlier, the mobilization phase was subdivided into the following components: (1) the precipitating event, (2) the transmission of rumors, (3) the crowd formation, and (4) the "milling" of crowds. At times the hostile outburst follows the precipitating event so rapidly that violence seems to explode. Usually, however, the period of mobilization continues from a few hours to a few days. During this crucial period, the agencies of social control must react quickly and decisively.

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Based on the nature of crowd behavior, the operational principles that can be applied to control crowds as well as mobs can be summarized as follows. Following the investigation of an incident, supervisory personnel must determine whether a threatening crowd will form and, if so, calculate its potential size and danger. If a threatening crowd seems likely to form, adequate numbers of security forces must be rapidly mobilized and suitably deployed. The deployed forces must maintain a posture of self-confidence and self-discipline, and must remain impartial to the issues and controversies that agitate the crowd. The authorities must counteract the spread of hostile rumors and subdue crowd aggressiveness. If a crowd must be dispersed forcibly, forethought must be used in selecting routes of escape so that the retreating crowd does not erupt in panic or pass through areas that are likely to be the target of aggression. When the police disperse the crowd, they should act in a methodical and determined manner but without excessive force. As the crowd disperses, special arrest teams should be sent into action to seize the leading agitators and instigators. The control forces should follow the dispersed groups at a discreet distance to ensure against their regrouping at another location. Finally, authorities must not delay in requesting outside assistance if the situation deteriorates beyond the control of local forces.

Crowds form regularly in the ghetto (as well as in other parts of the community) in response to an exciting or unusual event. Not all crowds are aggressive and not all aggressive crowds erupt in violence. On the other hand, given the proper stimuli, passive crowds can suddenly become aggressive.

Based on motivation, crowds may be categorized as casual, conventional, or expressive. A casual crowd is a temporary collection of people who happen to be present at a given location. It has no unity or organization. A conventional crowd is one which assembles at a designated site for a preplanned occasion such as a sporting event or parade. Expressive crowds are those involved in expressive behavior, such as dancing or singing. Police have mistakenly confused expressive crowds with aggressive ones and caused riots to result by forcibly dispersing them.

All crowds are susceptible to rioting and panic. Mobilized crowds form under the stimuli of hostile beliefs. They may form spontaneously, such as when people converge upon hearing rumors about an incident, or they may be planned such as when people congregate at a demonstration or rally. Mobilized crowds usually form to protect general societal conditions or a specific instance of social injustice and they are prone to engage in uninstitutionalized means of redress.

A common characteristic of all major riots is the rapid buildup of crowds. A crowd may enlarge so rapidly that the police cannot respond quickly enough to control the situation. In some instances where there is sufficient time, authorities lose control by failing to take decisive action.

A major problem of security forces is the prediction of crowd mobilization. Although police departments have greatly improved their ability to predict hostile crowds, increasingly sophisticated approaches are necessary. Many cities need to improve their intelligence techniques and emphasize the more

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effective use of undercover agents. Aerial observations may reveal significant disruptions in the patterns of daily activity. Better use of statistical data, such as resistance to arrest, false fire alarms, and so forth, also might contribute to the development of more effective prediction criteria.

If a threatening crowd appears likely to form, supervisory officials must use the appropriate mobilization plan. An effective plan will specify systematic procedures for the rapid notification, briefing, transportation, and deployment of all personnel designated for riot control assignments. Control forces must also be deployed in areas other than those near the scene of crowd activity. If the control forces are able to react quickly and with sufficient force, they will be able to change the structure of the social situation by reducing the facilities for violence.

It is believed the most effective initial approach to the control of a threatening crowd is a show of force sufficient to convince them that the control forces are capable of maintaining law and order and of dispersing the mob with physical force if necessary. An impressive display of power probably will induce the more timid members of the crowd to withdraw from the scene and discourage others from joining the crowd.

The major problem that is associated with the show of force tactic is the failure of the control forces to observe the cardinal rules of impartiality, firmness, and self-discipline. Intemperate or irresolute behavior may trigger a protesting crowd into a violent mob.

Control forces must counteract the spread of hostile rumors to avoid the multiplication of crowd strength and must interrupt the milling process to prevent heightened crowd cohesion and aggressiveness. Some of the tactics suggested are: impressively displaying police forces, isolating affected area; placing barriers along the inner and outer perimeters; altering the psychological frame of reference of individual crowd members, such as using means to reduce an individual's sense of unity and security in a crowd (counteracting crowd cohesion from within by the use of counterrioters) employing counterrioters as sources of information; offering crowd alternate courses of action; using persuasion tactics, and employing photography to destroy anonymity and engender anxiety.

If personal appeals fail and the show of force fails to disperse crowds, the only alternative may be forcible dispersal. Prior to any move to disperse the crowd, appropriate areas of dispersal and routes to be used should be selected. Rioters should be dispersed into the area in which they live or into an open area. Security forces must insure that retreating crowds use predesignated routes. In developing criteria for the applicability of specific devices, consideration must be given to the need by emergency vehicles of several access routes into and out of the affected area and also to the fact that crowds are susceptible to panic when they feel trapped.

The command to disperse and the routes to be used should be clearly heard by all members of the crowd. If the crowd refuses to obey the order, the authorities must act quickly and decisively. Indecision in the use of force encourages more disorder and eventually requires the imposition of measures

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more harsh than those which would have sufficed in the beginning. However, lack of suitable weaponry may be a factor that explains the indecision of the authorities.

An effective way to destroy crowd action is through arrests. Arrests for truly minor offenses should be avoided. Instead, the agitators and instigators should be arrested by undercover agents. When and how to remove the leaders is a crucial decision for the police commander to make. A logical approach would seem to be the arrest of agitators after the non-lethal weapons have been used to disorient the crowd members. Because arrest and evidence procedures are complicated, law enforcement officers need new technological devices to simplify their tasks.

In some instances, the security forces have committed the error of not pursuing the dispersed elements of the group. As a result, elements of the crowd regrouped at other locations and regained a spirit of aggressiveness and unity. Therefore, once a crowd has been dispersed, it must be kept moving and eventually be fragmented.

Many serious riots have erupted because of the reluctance of officials to request outside assistance, even when the size and anger of the crowd clearly indicated that the city police department no longer had the manpower and resources to control the situation. If serious disorders appear imminent, at the earliest moment possible officials must alert the state police and national guard, as well as other agencies that can provide assistance.

c. Hostile Outburst Phase

Many students of law enforcement contend that the primary strategy that security forces should employ during a high-intensity riot is to blanket the troubled area with security forces and to impose strictly enforced restrictions on movement and congregation. In addition, most of these proponents would include the use of community groups or youth gangs.

Almost all large cities and towns have developed plans to cope with civil disorders of varying intensities. Although it is impossible to anticipate every contingency, these plans usually are prepared with painstaking thought and detail. In these plans, procedures are specified for obtaining the assistance of outside agencies as well as for mobilizing all required internal resources. Nevertheless, recent experiences have indicated that no matter how adequate plans may look on paper, they may not work effectively in practice. The major problem in the past, as today, has been coordination. Coordination between agencies in the areas of operational planning, tactics, and weapons, and the administration of justice is required to insure smooth procedures to effectively combat civil disorder.

Effective command and control of operations require the clear designation of authority throughout the chain of command. In an emergency that involves several organizations, planning must clarify this command structure and specify the tasks and responsibilities of each agency.

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Adequate communications facilities between control and field headquarters, and within and between agencies, are essential for the coordination of riot-control operations. Prior planning should insure that the control agencies have special bands for emergencies and that the local police, fire department, state troopers, and national guard have at least one common emergency frequency. Units within each agency should also have the capability of communicating rapidly with their field headquarters, other agencies, and the command post. In addition, there must be facilities at control headquarters to keep the public informed about the disturbance.

Virtually all major police departments recognize the importance of an information center or rumor center during an emergency to counter the rise of tension inside and outside the riot area. This center can function not only to calm the fears of people regarding the welfare of relatives and friends but also as a source of information for the intelligence-gathering units.

Traffic control has been a major problem during many riots. Primary routes of access into and out of the troubled area should be specified to alleviate the congestion within and around the area.

Most riot control plans take into account the need for medical aid stations located near the tension zone to provide prompt treatment for injured security forces personnel and civilians.

Considerable improvement is needed in the equipment and supplies provided for the security forces. Since riot control vehicles are prime targets for rioters, it is necessary to make them less vulnerable to firebombs and missiles. All security forces, including the fire department, should have some protective equipment, e.g., force shields, crash helmets, and protective garments.

The missions of the security forces are the protection of life and property and the apprehension of law violators. However, numerous instances of inappropriate tactics are recorded. There have been instances where hesitation or underaction by the security forces have actually encouraged deviant behavior. Conversely, some authorities contend that riots have been sparked by the excessive use of force.

The objectives of riot control forces depend in part on the extent of development of the riot (i.e., phase of the riot). Nevertheless, general and overall objectives can be enumerated in terms of strategic and tactical interests of the riot control forces.

(1) Strategic:

- React rapidly to the threat (mobility)
- Preserve order
- Suppress riot
- Contain riot
- Limit destruction
- Protect lives and property.

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(2) Tactical:

Deter rioters
 Divert and reorient rioters
 Disperse and isolate rioters
 Arrest and apprehend rioters
 Identify and detain rioters
 Detect, locate, and neutralize snipers.

The emotional metamorphosis that both the dissidents and the general community undergo during an intense civil disorder requires that security forces be thoroughly trained to develop self-discipline and teamwork.

Official reports recommend the development of new tactics as well as new weapons. Experience has shown that the standard weapons and barriers of the police and guard are inadequate for combatting civil disturbances. Because of the danger to innocent people that is associated with firearms and the limited practicality of bayonet tactics, most city leaders discourage using these weapons during civil disturbances, except when the life of an officer is threatened. As a result of these restrictions, displaying these weapons does not have the deterrent effect on rioters that it once had. When these are the only weapons that are available during a civil disturbance, riot-control forces are in the frustrating position of having insufficient means to apprehend law violaters. For this reason, officials recommend expanding the arsenal of security force weapons to include various types of middle-level or non-lethal weapons. These weapons can provide the officer in most riot situations with a suitable increment of force to achieve his lawful objectives. The following general criteria have been offered for consideration in applying any non-lethal system.*

(1) The method should itself allow for controlled increments of force and risk or should be one of a group of weapons allowing for such increments.

(2) The device or technique should not endanger the police officer by aggravating the risk to him or by requiring him to perform in some extreme or heroic manner.

(3) The device should not be one which will embolden the criminal by giving him the feeling that he always has a second chance or that the officer's hands are tied.

(4) The device should not overburden the officer by requiring him either to carry more or bulkier items than are feasible or by demanding choices which are impractical in a crisis or under stress. Training can do much to mitigate the problem of choice.

(5) The device or technique should not necessarily endanger or antagonize bystanders.

* Coates, Joseph F., Nonlethal Weapons for Use by the U.S. Law Enforcement Officers, (S-271), Arlington, Virginia.: Institute for Defense Analyses, pp. 40-41. November 1967.

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(6) The device should not appear cruel or beneath human dignity, even if it is non-damaging. This is a difficult criterion to interpret, since it depends on both the weapon and effective community relations.

(7) The device and method should not be provocative if it is ineffectively used.

(8) Effectiveness should not be lost after first use against an individual or crowd, nor seriously mitigated by prior knowledge of training of those against whom it is used.

(9) The device should be applicable to many situations if used routinely. Unusual, but important, situations would justify special equipment.

(10) Derivative problems, such as health and safety of those against whom the device is used, logistics of removal of victims, burdens on hospitals for temporary treatment or observation, and clean-up of streets, should be taken into consideration.

(11) The use of the device should not disrupt other police functions.

(12) The weapon should be sufficiently unpleasant so that it does not provoke its own use.

(13) Techniques requiring very long training, special skills, and certain commitments are generally inappropriate.

(14) Control against unscrupulous use may be relevant to some weapons.

(15) Finally, costs for development and maintenance of the item must be taken into consideration.

In a ghetto riot situation, the principal tactical problems are the isolation of the riot area, protection of property, apprehension of riot leaders and dispersion of rioters.

Isolation of the riot area serves not only to prevent the spread of violence but also to minimize the likelihood that white vigilante groups will take the law into their hands.

During many disorders, environmental factors have caused difficulty for riot-control forces who were trying to secure a troubled area. For example, during the intense stages of the Watts riot, the pattern of small housing units enabled rioters to use alleys, gardens, and driveways in moving from street to street, thereby dodging and eluding security forces.

A lack of suitable barricades also has hampered attempts to seal off the riot area. Experience indicates that it may be inadvisable to use police cars as barricades, since nothing seems to excite rioters more than the sight of a burning police car.

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In riot situations where no personal threat is posed against the life of the officer, non-lethal weapons would seem to provide suitable increments of force for the dispersal or the apprehension of law violators. Because of the strain imposed upon the court system, as well as other factors, it may be desirable to be selective in arrests. Many authorities suggest that the security forces focus their effort upon the apprehension of the instigators and agitators of violence and upon other serious offenders of the law. A major problem encountered by security forces, however, is finding a way to apprehend fleeing or resisting suspects while protecting the physical well-being of the participants.

In spite of the fact that most cities had plans for the administration of justice in the event of large-scale civil disorder, experience of recent large-scale disorders indicates that the established procedures were inadequate to cope with the problems of apprehending, transporting, detaining, booking and trying prisoners. Instead of concentrating the apprehension effort on serious offenders of the law, the police frequently resorted to the techniques of wholesale arrests to clear the streets. As a result of the circumstances of quantity over quality of arrests, the police did not have adequate resources for gathering enough evidence to prosecute successfully the hard-core offenders. Suitable facilities for the transportation of prisoners to detention centers posed another major problem. Overcrowded detention facilities caused prisoners to suffer serious abuses and deprivations and caused officials acute embarrassment. Mass arrests also seriously taxed the capabilities of the low court system. Fewer arrests and more systematic identification procedures could help reduce this confusion.

d. Post-Hostile Outburst Phase

As noted earlier, the post-hostile outburst phase may be divided into an immediate and a derived stage. Whereas the immediate stage concerns the short-range measures to re-establish normality, the derived stage encompasses the long-range rehabilitative programs designed to restore the confidence of aggrieved ghettoites in the established channels for social redress.

Building or re-establishing public confidence in the legal channels for redress is critical in preventing further disorders. Insensitivity to common grievances and beliefs will only increase animosity and reinforce distrust, and thereby engender situations leading to new acts of aggression.

The derived stage is the critical time when all segments of the community, public and private, must work to remove or alleviate the conditions conducive to violence. Unfortunately, most post-riot studies do not reveal much that would lead to a relaxation of tensions.

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PART IIOPERATIONAL PROBLEMS

Security forces planning their materiel needs for civil disturbances must know exactly what problems they are likely to encounter. This part of the report represents an attempt to analyze civil disturbances in operational terms which suggest specific materiel solutions. In effect, it serves as a guide to the use of Part III: "Catalog of Materiel."

The system employed in analyzing and presenting the information is as follows. The civil disturbance is categorized into four phases as discussed in Part I:

Phase I - Pre-mobilization phase

Phase II - Mobilization phase

Phase III - Hostile outburst phase

Phase IV - Post-hostility phase.

Each phase is further subdivided into four functional areas which will be familiar to military users:

1. Administration
2. Intelligence
3. Combat Operations (General, Offensive, Defensive)
4. Logistics

The problems likely to be encountered by security forces are expressed as "missions" listed under the appropriate functional areas. Each mission is defined in terms of one or more operations required to perform the mission. The operations are related to equipment needs by a list of specific actions implied by the operations. An outline of the system used follows:

Phase (I through IV)

i. Functional Area (Administration, Intelligence, Combat Operations, and Logistics)

- a. Mission (problem)
 - (1) Meanings (operations,
 - (a) Specific Actions Required

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Although considerable effort was made to systematize this analysis of civil disturbances so that no important problem areas would be left out and their statements represent truly different problems, it must be recognized that the possibilities for applying scientific methods are strictly limited at present. Consequently, both the problem statements and their definitions reflect subjective judgments to a high degree.

Phase I: Pre-Mobilization

1. Administration

a. Planning and Training of Security Forces

Meanings

- (1) Develop strategy and tactics of anticipated actions.
- (2) Teach personnel tactical doctrine.
- (3) Teach personnel equipment operation and maintenance.
- (4) Coordinate plans of all security forces.

Specific Actions Required

- (a) Provide training facilities and aids.
- (b) Establish communication nets.
- (c) Establish inter-agency planning groups.
- (d) Set up a chain of command for all forces.
- (e) Develop a logistics system.

b. Counteract Rumors and Instigators with Information

Meanings

- (1) Publicly refute with truth.
- (2) Inform people of consequences of extreme solutions.
- (3) Advise people of available (legal) means for resolving problems.

Specific Actions Required

- (a) Employ communications systems (public address, public radio, TV, etc.).
- (b) Introduce undercover agents (address groups of people).

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(c) Publish literature.

2. Intelligence

a. Obtain Intelligence on Grievances, Threats, and Other Exciting Factors (i.e., troublemakers).

Meanings

- (1) Determine potential but unvoiced problems.
- (2) Determine what people are discussing in the community.
- (3) Determine what people are complaining about in an organized way.
- (4) Determine if there are individuals acting as catalysts to mob action.
- (5) Determine if there are organizations which provide direction, resources and channels for actions which can become unlawful.
- (6) Determine what resources are available to potential rioters.

Specific Actions Required

- (a) Use surveyors (observe conditions and interview people) to document the situation.
- (b) Inject undercover agents into the community to uncover secret plans and identify key leaders and organizations.
- (c) Provide means for maintaining secure communications with agents.
- (d) Provide a means for identifying undercover agents.

3. Combat Operations

a. Neutralize and Arrest Inciters to Violence with Minimum Excitation of Crowd.

Meanings

- (1) Physically take inciters off to jail.
- (2) Maximize acceptance by crowd of security force actions.
- (3) Reduce inciters influence on mob.

Specific Actions Required

- (a) Capture inciters.
- (b) Transport inciters to detention center.

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(c) Communicate intentions and purpose of security force to crowd.

(d) Prevent inciters from communicating with crowd.

4. Logistics

None.

Phase II: Mobilization

1. Administration

None

2. Intelligence

a. Obtain Intelligence for Legal Prosecution.

Meanings

(1) Identify the violator, his crime, and witnesses; and provide other supporting evidence for legal prosecution

Specific Actions Required

(a) Physically mark people and material for later positive identification.

(b) Record evidence "at the scene" which provides a detailed description of events and people.

(c) Obtain information from agents at the scene of disturbance.

b. Crowd Classification and Activity Prediction

Meanings

(1) Determine reasons for congregating.

(2) Characterize total crowd and its elements with respect to probable activities.

(3) Predict where crowd will form and reform.

(4) Predict dispersal routes.

Specific Actions Required

(a) Obtain information from agents and others in troubled area.

(b) Use resources of rumor control center to evaluate information.

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(c) Identify activists and composition of crowd.

(d) Conduct surveillance of troubled area.

3.1 Combat Operations - General

a. Command and Control of Security Force Operations

Meanings

(1) Alert and coordinate all security forces.

(2) Initiate planned operations (command posts and communication nets).

(3) Formulate new operations.

Specific Actions Required

(a) Communicate commands, requests, and information.

(b) Direct movement of troops and equipment to troubled areas.

(c) Utilize control centers to maximize effectiveness of command and control in response to changing situations.

(d) Coordinate efforts of all responsive forces (military, police, firefighters).

(e) Monitor operations.

3.2 Combat Operations - Offensive

a. Control Crowd Behavior and Actions

Meanings

(1) Calm and/or redirect crowd hostilities.

(2) Intimidate crowd.

(3) Apply force to destroy unity and mobility of crowd.

(4) Deny normally available services and supplies to crowd.

Specific Actions Required

(a) Communicate with crowd (oral, written, pictorial).

(b) Present a convincing show of force (manpower and weapons)

(c) Disperse crowd.

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- (d) Isolate individuals and groups.
- (e) Reorient crowd movement.
- (f) Arrest crowd members and remove from area.
- (g) Cut off utilities and supplies which support hostile activities.
- (h) Pursue and prevent regrouping.

3.3 Combat Operations - Defensive

a. Protect Non-Participants.

Meanings

- (1) Prevent violence against people who do not wish to take part in unlawful actions.

Specific Actions Required

- (a) Station guards to defend probable victims.
- (b) Emplace barriers and shields
- (c) Transport people away from troubled area.
- (d) Provide community shelters.

b. Protect Property

Meanings

- (1) Make preparations in anticipation of property damage.
- (2) Provide markings to identify stolen property.

Specific Actions Required

- (a) Provide shields to reduce susceptibility to damage.
- (b) "Mark" property to discourage stealing and facilitate recovery.
- (c) Install intrusion prevention equipment.

4. Logistics

a. Provide Emergency Board and Facilities for Troops

Meanings and Specific Actions Required

- (1) Self-explanatory.

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Phase III: Hostile Outburst1. Administration

a. None - No known administrative functions during this phase considered unique to riot control.

2. Intelligence

a. Rumor Control (Centers)

Meanings

(1) Channel rumors to collection center for analysis (to measure state of riot and provide basis for tactics changes).

(2) Provide a means for channeling problems to proper action agency.

(3) Generate counteraction information.

Specific Actions Required

(a) Start your own rumors.

(b) Disseminate facts to information media.

(c) Publish literature.

(d) Orally address riotous groups.

(e) Provide means of communicating with sources of rumor.

(f) Provide means of communicating with action agencies.

b. Obtain Intelligence for Legal Prosecution

Meanings and Specific Actions Required

(1) See Phase II: 2.a.

3.1 Combat Operations - General

a. Command and Control of Security Forces

Meanings

(1) Insure that actions of various forces are complementary.

(2) Insure that actions are properly timed.

(3) Provide information on tactical activities to all concerned.

Specific Actions Required (See Phase II: 3.1.a)

- (a) Employ communications net.
- (b) Employ means for visual surveillance of action.
- b. Enforce Restrictions on Movement and Congregation

Meanings

- (1) Restrict vehicular movement into and out of troubled area.
- (2) Keep travel routes from being blocked.
- (3) Prevent rioters from spreading their activities.
- (4) Keep the curious out of troubled area.
- (5) Keep potential riot supporters out of troubled area.
- (6) Enforce curfew.
- (7) Prevent formation of hostile groups.

Specific Actions Required

- (a) Emplace physical barriers to obstruct and divert people and vehicles.
- (b) Set-up manned traffic control points.
- (c) Set-up traffic-monitoring system.
- (d) Provide a traffic signal system (lights, sound, police identifiers).
- (e) Provide a means for identifying authorized people and vehicles.
- (f) Provide a means for broadcasting travel restrictions to the general public.
- (g) Provide street-clearing equipment to move people and obstructions from roads.

3.2 Combat Operations - Offensive

- a. Inhibit, Disorganize, and Arrest Riotous Activities with Minimum Necessary Force.

Meanings

- (1) Apply various degrees of force to break up crowds.

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(2) Maintain controlled dispersion of fragmented crowd to prevent regrouping.

(3) Limit or destroy mobility of crowd.

(4) Divert riotous groups from target.

(5) Arrest lawbreakers

Specific Actions Required

(a) Use offensive weapons to fragment and divert mob.

(b) Pursue groups to prevent regrouping.

(c) Use weapons which prevent free movement of people.

(d) Employ barricades (barbed wire, wooden fences).

(e) Use weapons and restraining devices to capture lawbreakers.

3.3 Combat Operations - Defensive

a. Protect Security Forces (passive)

Meanings

(1) Provide passive protection from mob aggression.

(2) Impair physical movement of crowd.

(3) Obscure the positions of security forces (smoke, camouflage).

Specific Actions Required

(a) Emplace barriers

(b) Employ body armor and shields.

(c) Generate smoke screens.

(d) Introduce movement impiders (caltrops, slippery chemicals, etc.).

b. Protect Non-Participants

Meanings and Specific Actions Required

(1) See Phase II: 3.3.a

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c. Protect Property

Meanings

- (1) Prevent rioters from damaging property.
- (2) Prevent rioters from stealing property.
- (3) Prevent rioters from trespassing.

Specific Actions Required

- (a) Bar entry into private property.
- (b) Provide "shields" to reduce susceptibility to damage.
- (c) Prevent access to area of property (i.e., business districts).
- (d) Minimize fire and other forms of damage.
- (e) Protect fire-fighting and damage control equipment.

4. Logistics

a. Quickly Saturate Troubled Area with Security Forces

Meanings

- (1) Use ground and air vehicles to speed dispatch of forces.

Specific Actions Required

- (a) Provide suitable vehicles for transporting forces.
- b. Provide Medical Aid

Meanings

- (1) Provide local first-aid stations.
- (2) Include means for treating effects of non-conventional weapons.
- (3) Provide convalescent facilities to supplement hospitals.
- (4) Provide ambulance services.

Specific Actions Required

- (a) Provide fixed and mobile first-aid shelters.

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(b) Equip medical stations with specialized drugs, etc., related to the use of non-conventional weapons.

(c) Adapt existing buildings for use as convalescent centers.

(d) Provide vehicles equipped to transport the injured.

Phase IV: Post-Hostility

1. Administration

a. Provide Emergency Instructions to People of Troubled Area

Meanings

(1) Inform people of availability and procedures for obtaining emergency supplies and assistance.

Specific Actions Required

(a) Widely publicize instructions by means of public radio, TV, printed bulletins, and word-of-mouth.

2. Intelligence

a. None

3. Combat Operations

a. None

4. Logistics

a. Re-establish Public Services

Meanings

(1) Temporarily provide manpower and/or equipment to re-establish utilities, transportation, shelter, clothing, operation of critical structures (bridges), etc.

(2) Maintain law and order.

Specific Actions Required

(a) Provide suitable vehicles, electric generators, telephone complexes, etc.

(b) Provide trained manpower to temporarily perform civil police functions.

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b. Provide Emergency Food and Medical Care

Meanings

- (1) Continue medical system activated in Phase III.
- (2) Bring in and distribute food rations (may include "mess-hall" type facilities).

Specific Actions Required

- (a) Actions are clearly described by the Meanings above.

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PART III

CATALOG OF MATERIEL ITEMS

This part of the report describes a large number of materiel items which have been proposed for use in civil disturbances. They are intended to be unique in the sense that they respond to the special requirements of civil riot control as contrasted with normal military combat operations. The catalog includes items from the original USALWL Catalog, the RACIC study and the Booz-Allen Applied Research, Inc. investigation, all of which were described in the Introduction.

The table preceding the catalog serves as both a key to its organization and an index of its contents. In addition, it provides a means for identifying at least some materiel solutions for the problem areas defined in Part II of this report. The catalog items are grouped in accordance with the outline across the top of the table. The problem areas (missions) of Part II are outlined at the left of the table. An example of its use is as follows:

Suppose one of the problems of the reader is to calm crowds, before they become hostile, without the use or even a suggestion of the use of force. He could find that this specific problem is covered by problem area 3.2.a under Phase II at the left side of the table. Of the possible solutions indicated in that row of the table, those items listed under column C.1.2 (Support Equipment, Communications, Public Address) may be of interest and will be found in section C.1.2 of the catalog. The individual public address systems are identified as items C.1.2.1 (Helmet-Mounted P. A. System), C.1.2.2 (Electronic Megaphone), C.1.2.3 (Hand-Held Electronic Megaphone) and so forth.

Of course, the catalog can be used without reference to Problem Areas on the left side of the table by simply using the column headings as a table of contents.

The following information is provided, where available, for each of the items in the catalog:

1. Device Number: this is a number derived from the table column-headings as discussed above.
2. Device Title: self-explanatory.
3. Problem Areas: these are code "numbers" which cross reference the item to applicable problem areas outlined at the left of the table and in Part II of the report. The same identifying codes are used throughout the report.

4. Description: this includes

- a. Identification of source (manufacturer or originator of idea) and

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model number.

b. Physical description and performance characteristics.

c. Possible modifications (variations of basic features) and options (additions to basic equipment).

d. Cost of item: both development costs and purchase prices of items are given where possible and appropriate. For those items which are being sold commercially, the manufacturer's quoted price is given. Otherwise, the cost has been estimated by people technically familiar with similar equipment.

5. Status: A number code is used to indicate the state of availability. The number 1 (one) identifies those items which have been fully developed and are available either "off-the-shelf" or by immediate production. The number 2 (two) identifies developmental items; that is, those which have been shown to be technically feasible, but which have not yet been produced in a form for user application. For planning purposes, it may be estimated that such items can be fully developed in a period ranging from three months to one year. The final code, number 3 (three) identifies both those items which are presently being researched and those which exist only as promising concepts. Although all of the category 3 items are judged to be within the "state-of-the-art" of the technologies involved, none should be expected to reach full development in less than six months, and some may require as long as two or three years.

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A OFFENSIVE DEVICES

B PROTECTIVE DEVICES

PHASE I - PRE-MOBILIZATION

- 1 Administration
 - a. Planning & Training of Security Forces
 - b. Counteract Rumors & Instigators with Information
- 2 Intelligence
 - a. Obtain Intelligence on Grievances, Threats, & Other Exacting Factors
- 3 Combat Operations
 - a. Neutralize & Arrest Inciters to Violence
- 4 Logistics

PHASE II - MOBILIZATION

- 1 Administration
- 2 Intelligence
 - a. Obtain Intelligence for Legal Prosecution
 - b. Crowd Classification & Activity Prediction
- 3.1 Combat Operations - General
 - a. Command & Control of Security Forces
- 3.2 Combat Operations - Offensive
 - a. Control Crowd Behavior & Actions
- 3.3 Combat Operations - Defensive
 - a. Protect Non-Participants
 - b. Protect Property
- 4 Logistics
 - a. Provide Emergency Board & Facilities for Troops

PHASE III - HOSTILE OUTBURST

- 1 Administration
- 2 Intelligence
 - a. Rumor Control (Centers)
 - b. Obtain Intelligence for Legal Prosecution
- 3.1 Combat Operations - General
 - a. Command & Control of Security Forces
 - b. Enforce Restrictions on Movement & Congregation
- 3.2 Combat Operations - Offensive
 - a. Inhibit & Break-Up Riotous Activities w/ Minimum Necessary Force
- 3.3 Combat Operations - Defensive
 - a. Protect Security Forces
 - b. Protect Non-Participants
 - c. Protect Property
- 4 Logistics
 - a. Quickly Saturate Troubled Area with Security Forces
 - b. Provide Medical Aid

PHASE IV - POST-HOSTILITY

- 1 Administration
 - a. Provide Emergency Instructions to People in Riot Areas
- 2 Intelligence
- 3 Combat Operations
- 4 Logistics
 - a. Re-establish Public Services
 - b. Provide Emergency Food & Medical Aid

I. FIREARMS																										II. COMMUNICATIONS																									
1. HANDGUNS																										1. COMMUNICATIONS																									
2. RIFLES: SINGLE & AUTO																										2. COMMUNICATIONS																									
3. SHOTGUNS																										3. COMMUNICATIONS																									
4. ARTILLERY																										4. COMMUNICATIONS																									
5. MISCELLANEOUS																										5. COMMUNICATIONS																									
2. CHEMICAL																										6. COMMUNICATIONS																									
1. PHYSIOLOGICAL																										7. COMMUNICATIONS																									
1. GRENADES																										8. COMMUNICATIONS																									
2. SPRAYS & FOGGERS																										9. COMMUNICATIONS																									
3. LIQUID																										10. COMMUNICATIONS																									
4. STREAMS																										11. COMMUNICATIONS																									
5. OBSCURATION																										12. COMMUNICATIONS																									
1. SMOKE GRENADES																										13. COMMUNICATIONS																									
2. SMOKE GENERATORS																										14. COMMUNICATIONS																									
3. MECHANICAL																										15. COMMUNICATIONS																									
3. WATER																										16. COMMUNICATIONS																									
4. SOUND																										17. COMMUNICATIONS																									
5. HEAT/COLD																										18. COMMUNICATIONS																									
6. LIGHT																										19. COMMUNICATIONS																									
7. ANIMALS																										20. COMMUNICATIONS																									
8. ELECTRICAL																										21. COMMUNICATIONS																									
9. MISCELLANEOUS																										22. COMMUNICATIONS																									
10. BARRIERS																										23. COMMUNICATIONS																									
11. MATERIAL SHIELDING																										24. COMMUNICATIONS																									
12. PERSONAL PROTECTIVE EQUIP																										25. COMMUNICATIONS																									
13. MISCELLANEOUS																										26. COMMUNICATIONS																									

1. DEVICE NUMBER: A.1.1
2. DEVICE TITLE: Handguns
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: There are a number of commercially available handguns suitable for use as anti-riot weapons. These include the standard revolvers, automatic pistols, single-shot dart projectile guns, and the less conventional modified versions of these and/or their projectiles. Table A.1.1 contains a listing of proposed and currently available handguns and projectiles.

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TABLE A.1.1

HANDGUNS

Mfr/Model	Description	Caliber	Barrel Length (in)	Ammo Capacity	Approx Wt (oz)	Overall Length (in)	Est Cost	Status	Comments
							Devel	Code	
1. <u>Mercor, Inc.</u>									
Single-shot dart projectile gun	Built on Smith & Wesson K22 frame; has smooth bore barrel w/gas metering valve & chamber connected to it; fires dart-like projectiles containing C1 or other non-lethal chemical agents or hypodermic syringe projectile.	0.22		1				2	
2. <u>Bellert & Freed</u>									
0.410 Revolver	Revolver chambered for the 3-in Magnum 0.410 gauge shotgun shell. Barrel has 0.45-in to 0.41-in funnel-like throat, followed by four step-downs in bore, ending in a 0.357-in muzzle which is rifled for last 0.5 to 1-in of its length. Shot, rifled slugs, or five lead balls can be fired from one shell.							1	
3. <u>Thompson</u>									
0.410 Pistol	Single-shot handgun with wide range of interchangeable barrels for various calibers from 0.22 Rimfire to 0.45 Colt. Removable muzzle choke for cal 0.45 version permitting use of 0.410 shot-shells in either 2.5 or 3-in length.			1				1	

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TABLE A.1.1.1 (cont)

HANDGUNS

Model	Description	Caliber	Barrel Length (in)	Ammo Capacity	Approx Weight (lb)	Overall Length (in)	Est Cost		Status Code	Comments
							Devel	Unit		
Smith & Wesson, Inc. (a)										
4. Model 10	Revolver	.38 Special	2-4-5-6	6	31 (6-in bbl)(6-in bbl)	11-1/2			1	Also available: Heavy version with 4- in bbl and airweight Model 12
5. Model 15 Combat Masterpiece	Revolver	.38 Special	2-4	6	30 (2-in bbl (4-in bbl loaded)	9-1/2			1	Adjustable sights; also available: 22 LP for possible training purposes with 4-in bbl.
6. Chiefs Special	Revolver	.38 Special	2-3	5	10 (2-in bbl)(2-in bbl)	6-1/2			1	Also available: 14- oz lightweight model and model 60 stain- less steel version.
7. Model 27	Revolver	.357 Magnum	3-1/2 5-6-6- 1/2-8- 3/8	6	44-1/2 (6-1/2 in bbl)	11-3/8 (6-in bbl)			1	Adjustable sights.
8. Model 57	Revolver	.41 Magnum	4-6; 8-3/8	6	42 (6-in bbl)(6-in bbl)	11-3/8			1	Adjustable sights. Also available: Model 58 with fixed sights and 4-in bbl.
9. Model 39	Automatic	9mm Parabellum	4	8	26-1/2 (w/o mag- azine)	7-7/16			1	The only US made autoloading pistol with double-action feature.

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TABLE A.1.1 (CONT)

HANDGUNS

Mfr/Model	Description	Caliber	Barrel Length (in)	Ammo Capacity	Approx Wt (oz)	Overall Length (in)	Est Cost	Status	Comments
							Devel	Unit	Code
Colt Industries (b)									
10. Diamondback	Revolver	.38 Special	2-1/2; 4	6	29 (4-in bbl)(4-in bbl)	8-3/8			1
									Also available: 22 LR; has ventilated rib and adjustable sights.
11. Cobra	Revolver	.38 Special	2;3;4	6	15 (2-in bbl)(2-in bbl)	6-3/4			1
									Also available: 22 LR; Detective Special and the Agent are similar models.
12. Official Police	Revolver	.38 Special	4;5;6	6	35 (6-in bbl)(4-in bbl)	9-1/4			1
									Also available: 22 LR; 22 LR not available with 5-in bbl.
13. New Police Python	Revolver	0.357 Magnum	2-1/2; 4;5	6	41 (4-in bbl)(4-in bbl)	9-1/4			1
									Has ventilated rib and adjustable sights.
14. Trooper	Revolver	0.357 Magnum	4;6	6	36 (4-in bbl)(4-in bbl)	9-1/4			1
									Adjustable sights.
15. Government Model (c)	Automatic	0.45 ACP	5	7	39	8-1/2			1
									Also available: .38 Super auto with a 9-shot magazine; target grade pistol.

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TABLE A.1.1 (CONT)

HANDGUNS

Mfr/Model	Description	Caliber	Barrel Length (in)	Magazine Capacity	Approx Weight (oz)	Overall Length (in)	Est Cost Level	Status Code	Comments
16. Commander	Automatic	.45 ACP	4-1/2	7	26-1/2	8		1	Also available: .38 Super auto and 9mm Parabellum.
17. Charter Arms Corp									
Undercover	Revolver	.38 Special	2:3	5	16 (2-in bbl)(2-in bbl round butt)	6-1/4		1	

Conceptual options to the standard projectiles include projectiles composed of a substance flexible enough that it will only temporarily render an individual unconscious, with no permanent injury. Such an item could be made available within 12-18 months.

- (a) Other Smith & Wesson revolvers available are: Model 14 K-38, Model 38 Bodyguard, and Model 40 Centennial in .38 Special; Model 19 Combat Magnum and Model 28 Highway Patrolman in .357 Magnum; and Model 25 in .45 ACP.
- (b) Other Colt revolvers available are: The Police Positive Special Revolver and Officers Model Match Revolver in .38 Special.
- (c) Colt .45 ACP and .38 Super Auto pistols can be converted to 22 LR for training purposes with a special conversion unit.

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1. DEVICE NUMBER: A.1.2
2. DEVICE TITLE: Long-Barreled Small Arms
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: Included under this category are both conceptual and commercially available long-barreled small arms (rifles, carbines, and sub-machines) and projectiles. A listing of these is presented in the following Table.

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TABLE A.1.2

LONG-BARRELED SMALL ARMS

	Mfr/Model	Description	Caliber	Weight (lb)	Barrel Length (in)	Overall Length (in)	Magazine Capacity	Est Cost		Status Code
								Dev	Unit	
<u>Winchester Repeating Arms Co</u>										
1.	Model 70	Bolt action	.30-06	7	22	42-1/2	5			1
		Bolt action, target model	.30-06	10-1/4	24	44-1/2	5			1
		Bolt action	.308	7	22	42-1/2	5			1
		Bolt action, target model	.308	10-1/4	24	44-1/2	5			1
2.	Model 570	Bolt action, carbine	.30-06	6-3/4	19	39-1/2	4			1
		Bolt action	.30-06	7	22	42-1/2	4			1
		Bolt action	.308	7	22	42-1/2	4			1
3.	Model 150	Semi-automatic, carbine	.308	7	19	39-1/2	4			1
		Semi-automatic	.308	7-1/4	22	42-1/2	4			1
<u>Remington Arms Co</u>										
4.	Model 742	Semi-automatic	.30-06	7-1/2	22	42	4			1
		Semi-automatic	.308	7-1/2	22	42	4			1
		Semi-automatic, carbine	.30-06	6-3/4	18-1/2	38-1/2	4			1
		Semi-automatic, carbine	.308	6-3/4	18-1/2	38-1/2	4			1
5.	Model 755	Bolt action	.222	7	24	45-1/2	6			1
		Bolt action	.30-06	7	22	42-1/2	5			1
		Bolt action	.308	7	22	41-1/2	5			1
		"Varmint Special," bolt action	.223	9	24	42-1/2	6			1
					Hvy bbl					
6.	Model 758	Bolt action	.222	7-1/2	24	43-5/8	4			1
7.	Model 660	Bolt action, carbine	.222	6-1/2	20	38-3/4	6			1

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TABLE A.1.2 (CONT)
LONG-BARRELED SMALL ARMS

	Mfr/Model	Description	Caliber	Weight (lb)	Barrel Length (in)	Overall Length (in)	Magazine Capacity	Est. Cost		Status Code
								Dev	Unit	
<u>Universal Firearms Corp</u>										
8.	Carbine Enforcer	Carbine	.30	3	10-1/4	19-1/2	5,15,30			1
9.	<u>Thompson</u>	Submachine gun, semiautomatic & automatic, automatic firing rate approx 600-700 shots per min, effective range approx 100 yds.	.45 ACP							1
10.	<u>Reising</u> Model 50	Submachine gun, cyclic rate of fire between 450 and 600 shots per min, effective range about 100 yds, simple and ruggedly constructed.	.45 ACP							1
11.	<u>Smith & Wesson</u> Model 75	Submachine gun, cyclic rate of fire about 720 rounds per min, extremely reliable w/folding buttstock.	9mm Parabellum							2
12.	<u>Colt Industries</u> Commando or CAR-15	Submachine gun, essentially a shortened M16, cyclic rate of fire of 700 to 900 rounds per min.	.223 (5.56mm)							2

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TABLE A.1.2 (CONT)

LONG-BARRELED SMALL ARMS

Mfr/Model	Description	Caliber	Weight (lb)	Barrel Length (in)	Overall Length (in)	Magazine Capacity	Est Cost Dev	Unit	Status Code
13. Gas-Powered Dowel Gun	This is a conceptual gun which would fire wooden dowels approx 1 ft in length. Dowels would be designed to rotate about a transverse axis and would be fired to trip the running rioter.						\$150,000	100	3

In addition to the standard ammunition, the same conceptual options listed under handguns are applicable to long-barreled small arms.

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1. DEVICE NUMBER: A.1.3
2. DEVICE TITLE: Shotguns
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: Standard commercially available shotguns; specialized shotguns designed for particular types of applications concepts for specialized anti-riot shotguns and both standard and proposed ammunitions are included here. Table A.1.3 contains a listing of these devices.

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TABLE A.1.3

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SHOTGUNS

Item	Description	Dev.	Est Cost	Unit	Status Code
1. Remington, Model 870-P (Order No. 5030)	Standard riot shotgun, slide action, 12 gauge				1
2. Mossberg, Model 500	Standard riot shotgun, slide action, 12 gauge				1
3. Winchester Riot Model 1200	Standard riot shotgun, slide action, 12 gauge				1
4. Ithaca Models 37 and 37DS	Standard riot shotguns, slide action, 12 gauge				1
5. High Standard Models 8104, 8111	Standard riot shotguns, slide action, 12 gauge				1
6. High Standard Model 10 Police Shotgun	Semi-automatic, designed especially for police use, 27 in long, 18-in barrel, weighs 7 lbs, searchlight mounted above barrel and bore-sighted at 30 yds.				1
<u>Specialized 12-gauge Ammunition</u>					
7. Low-Density Liquid Shotgun Shell	Shotgun shell loaded with a small plastic bag which is filled with a small amount of water or lower density liquid. Plastic bag will break on impact, but deliver sufficient energy into the object to cause pain and a bruise, but not break the skin.	20,000			3
8. Tear Gas Cartridge	Muzzle dispersion tear gas cartridges for dispersing CS at close range.		* 5.00		1
9. Tear Gas Cartridge	Muzzle dispersion tear gas cartridges for dispersing CS at long-range distances (up to 150 yds).		*12.50		1
10. Signal Flare Cartridges	Signal flare cartridges that will reach an altitude of 300 ft.		* 5.00		1
11. Barricade-Penetrating CS Cartridges	A soft rubber missile that bursts on impact to release CS tear gas. Cartridge will reportedly penetrate 3-inch plywood at 30 feet and conventional window glass at 50 yards.		*12.50		1

*Unit is box of 5

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TABLE A.1.3 (CONT)

SHOTGUNS

Item	Description	Est Cost		Status Code
		Dev	Unit	
12. Injection Molded Plastic Round	Molded plastic round, capacity of 2.5 cc chemical agent, will penetrate a vehicle windshield at close range and at 100 yds will penetrate double glazing and aluminum shield.			2

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1. DEVICE NUMBER: A.1.4
2. DEVICE TITLE: Artillery
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: Devices included under artillery are large caliber delivery mechanisms such as mortars and rocket launchers and also specially designed projectiles. These are listed in Table A.1.4.

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TABLE A.1.4

ARTILLERY

Device/Manufacturer	Description	Est Cost		Status
		Dev	Unit	
1. Mortar	Hand-held (or knee mortar) launching device; provide accurate delivery of gas grenade at ranges up to 300 yards.	\$25,000	\$ 50.00	3
2. Riot Guns	All purpose, appearance to emphasize non-lethal characteristics, probably large-caliber, for delivery of large-caliber CS grenades at extended range as a mortar, launch hypodermic darts or gels at short range.	75,000	50.00	3
3. Grenade Launcher Federal Laboratories, Inc.	Slightly longer than standard M79 grenade launcher, fires two loads - (1) a 0.32 caliber shot-type shell containing nine shots which can be lethal within 25 yards, but which packs authority beyond that range, and (2) a wood dowel projectile approximately 1-1/2 inches long and resembling a section sawed off a broomstick; dowel projectiles would be impacted a few feet from rioters, would splinter on impact and splinters would hit rioters at about shin level.		200.00	1
4. Grenade Launcher AAI Corporation Federal Laboratories, Inc.	Shotgun tear gas grenade launcher; clamps to muzzle of any standard shotgun, made of aluminum, weighs 1-1/4 pounds.			1
5. Grenade Launcher Federal Laboratories, Inc.	Grenade launcher as accessory to 201-Z gas gun; will lob grenades up to distance of 125 yards.		85.00	1
<u>Tear Gas Guns</u>				
6. Lake Erie Chemical Co.	Tear gas gun system based on True Flyte Shoulder Gas Gun; gun chamber to accommodate any 1-1/2 inch caliber gas shell, barrel length of 14 inches, one-piece receiver, and a conventional full pistol grip. The following three projectiles have been designed for this gun: (1) Impact-fused, non-incendiary shell, for accurate shooting up to 100 yards, will penetrate windows and doors at closer ranges. (2) Longer-range projectile available in either 75-yard range version or 150-yard version, non-incendiary.		93.00	1
			10.65	1
			2.40	1

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TABLE A.1.4 (CONT)

ARTILLERY

Device/Manufacturer	Description	Est Cost		Status
		Dev	Unit	
7. Federal Laboratories, Inc.	(3) Short-range shell, projects gas about 35 feet from gun muzzle.		6.40	1
	All three types of projectiles available with Cl, CS, DM, Cl-EDA, or white smoke. Unit costs listed are for Cl-filled projectiles.			
	Gun System based on Gas Gun 201-Z, weighs 7-3/4 pounds, 29 inches long, 1-1/2 inch caliber bore. The following projectiles are available for this weapon:		13.00	1
	(1) Flight-Kite Projectile 230; will penetrate windows, door panels, and other light structures; accurate up to 100 yards; available loaded with Cl, CS, or DM, listed unit cost is for Cl-filled projectile.		10.65	1
	(2) Blast Dispersion Projectile 232; accurate up to 100 yards; same penetrating capability as Flight-Kite Projectile 230; upon impact projectile bursts along serrations in its sides throwing off large cloud of agent gas w/o fragments; fire-safe; available loaded with Cl or CS. Listed unit cost is for Cl-filled projectile.		1.55	1
	(3) Spedeneat Projectile 206, maximum range of 150 yards; produce visible cloud of agent for 23 to 35 seconds with no explosion; available loaded with Cl, CS, or DM, listed unit cost is for Cl-filled projectile.		3.40	1
	(4) Short-Range Cartridge 203; used to blast out agent cloud directly from gun muzzle to about 35 feet; available loaded with Cl, CS, or DM, listed cost if for Cl-filled projectile.		5.40	1
<u>Accessories</u>				
8. 460 Inclinator	For accurate firing of projectiles from 201-Z Gas Gun. Attaches to left side of breech of gun; indicates angle of firing; range card supplied with inclinometer from which to read projectile range as function of angle.		1.50	1

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1. DEVICE NUMBER: A.1.5
2. DEVICE TITLE: Miscellaneous Offensive Devices
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: This concept is a low-energy, area-fire counterriot weapon that propels small pellets at a low velocity throughout the general area encompassed by the mob. It would be a multiple-barrel system with each barrel pointed at a slightly different angle. It could be either a handgun, tripod-mounted or vehicle-mounted and could be designed as a semi-automatic weapon system with automatic loading of each barrel. It could be designed for either ripple firing or for simultaneous firing of all barrels. Such a system could be used to launch capsulized incapacitating agents.

A prototype model of either the handgun or the vehicle-mounted weapon could be fabricated in-house within eight months at a cost of approximately \$10,000.

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1. DEVICE NUMBER: A.2.1

2. DEVICE TITLE: Chemical Agents - Physiological

3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a

4. DESCRIPTION: This category includes chemical agents which produce physiological effects, and devices for dispersing the agents. Table A.2.1 lists some of the commercially available physiological chemical agents and also some proposed new and/or improved agents.

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TABLE A.2.1

PHYSIOLOGICAL CHEMICAL AGENTS

Agent	Description	Est Cost		Status
		Dev	Unit	
1. Dimethylsulfonide (DMSO)	Unique capability to penetrate human tissue and carry with it dissolved chemical agents; hence, absorption of chemicals into blood and tissue can be made very rapid and specific. DMSO may be injurious to some local body organs but has not been fully tested.			2
2. Chemical MACE Alternative Ingredients	MACE, made by GDEC, is a solution containing 0.9% CN, 4% Kerosene, and Freon propellants, \$10,000 such as 1,1,1-trichloroethane (TCE). Kerosene and TCE produce direct toxic effects, especially on nervous system and lungs. Reportedly, they are present only to dissolve CN and air aerosolization. Safer solvents, like ethers or alcohols, and safer propellants are needed.			3
3. Itch-Inducing Agents	Itching powder prepared from the tropical plant cowhage (<i>Mucuna Pruritus</i>), proteolytic enzymes, and dilute acid solutions induce itch. Particular attention needs to be given to side effects, safety, and problems of clean-up associated with the use of itch-inducing agents. These efforts should be blended with a search for an appropriate synthetic substance.			3
4. Pain-Producing Drugs	Pain can be induced chemically through intradermal injection of inorganic or organic acids. Depending on nature of acid, pain may last for 6 to 22 minutes. Oral intake of certain thymol ether derivatives by human subjects have produced severe aching and tenderness of all muscles of the body, especially of the arms and legs. A 20-mg dose produces violent muscle pains, violent headache, vomiting and difficulty in breathing.			3
5. Sticky Aerosols/Jets	Could be an irritant with malodorous itching, nausea, or other agents. Might also contain substance attracting subsequently released insect swarm.	50,000	5.00	3
6. Sedative Aerosol	Sedative secondary tranquilizing effect could be aerosolized and disseminated as spray; produce hypnotic effects, drowsiness, and eventually lead to sleep.	80,000		3
7. Pepper Extract	Liquid containing the burning agent pepper (capsaicin) as active ingredient.	5,000		2
8. Pore-Closing Aerosol	Astringent, pore-closing aerosol; used in conjunction with heated air blasts would be most discomforting.			3

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1. DEVICE NUMBER: A.2.1.1
2. DEVICE TITLE: Chemical Grenades
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: Included in this category are commercially available and conceptual chemical grenades designed for dispensing agents which produce a physiological effect. In addition, a new agent container material is suggested. These are presented in Table A.2.1.1.

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TABLE A.2.1.1

CHEMICAL DISPENSING GRENADES

Device/Manufacturer/Model	Description	Est Cost		Status
		Dev	Unit	
<u>Chemical Grenade</u>				
<u>Penguin Associates</u>				
1. Penguin G-1	Plastic grenade, baseball-size and-shape, available loaded with CN, CS, or DM.	\$	9.95	1
2. Penguin G-2	Plastic grenade, baseball-size and-shape, available loaded with CN and green dye, CS, or DM.		9.95	1
3. Penguin G-3	Metal canister with standard military fuze, available loaded with CN, CS, DM, or smoke agent.		9.95	1
<u>Federal Laboratories</u>				
4. Federal 112	Metal canister, non-explosive, 25 to 30 seconds burning time, available loaded with CN, CS, DM, or smoke agent.		11.30	1
5. Federal 112 a	Metal canister, used on federal gas guns, loaded with CN.		12.25	1
6. Federal 115	Metal canister, breaks into 3 sections each of which bounces for several yards, 20 to 25 seconds burning time, available loaded with CN or CS.		13.75	1
7. Federal 120	Metal canister, fire-safe, gives off a special floating cloud of gas, available loaded with CN and CS.		15.90	1
8. Federal 121	Metal canister, non-explosive, fire-safe, available loaded with CN or CS.		11.30	1
<u>Lake Erie Chemical</u>				
9. Lake Erie 1 CN	Aluminum canister, 4-3/4 seconds burning time, available loaded with CN, CS, DM, or smoke agent.		13.75	1

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TABLE A.2.1.1 (CONT)

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CHEMICAL DISPENSING GRENADES

Device/Manufacturer/Model	Description	Est Cost		Status
		Dev	Unit	
10. Lake Erie 2 CII	Aluminum canister, launchable by Lake Erie Grenade Launcher No. 23, 25 to 30 seconds burning time, available loaded with CII, CS, or smoke agent.	\$15,000	\$11.30	1
11. Lake Erie 3 CII	Aluminum canister instantaneous discharge or 2-second delay, available loaded with CII or CS.		11.30	1
12. Lake Erie Model 34 AAI Corporation	Blast dispersion discharge, available loaded with CII, CS, DII, or smoke agent.		11.20	1
13. Multi-Purpose Grenade	Can be hand-held, thrown, or launched, non-explosive, instantaneous discharge, 2-second delay, or 5-second delay, available loaded with CII, CS, or a dye.		13.00	1
14. CS Mini Grenade	Device consists of small canister approximately 1-1/8 inches diameter and 1-1/4 inches high. Each unit contains an ignition system, a small fuel block, and several capsules of agent CS. Total gross weight per unit is 1.2 ounces. The unit disseminates agent CS as an aerosol for approximately 6 seconds.		1.50	1
15. Handy Andy 2 WRD Cartridges	Hand-held or pyrotechnic pistol-launched rubbery projectiles that disseminate CS agent. Projectile is 7-1/2 inches long, 1-1/2 inches in diameter, 1/8 inch in wall thickness, and contains 42% CS and the rest pyrotechnic mix. When fixed with an M79 Grenade Launcher, the mixture can be projected to about 70 to 100 yards.	15,000	5.00	2
16. Spinning Gas Grenade	Anti-riot grenade with delivery orifices so designed and placed that high-velocity exit gases cause grenade to spin wildly and thereby prevent throwback by rioters. Asymmetric distribution of weight will randomize motion.	25,000	5.00	2
17. Anti-Riot Dispensing Tetrahedrons	A simple plane-sided grenade, such as tetrahedron or cube, is desirable. Such a grenade would tend to remain at the point to which it was thrown and not roll out of effective range.	1,500	5.00	2
18. Vertigo-Inducing Drug Grenade	Grenade to dispense vertigo-inducing drug.	50,000	5.00	3

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TABLE A 2.1.1 (CONT)

CHEMICAL DISPENSING GRENADES

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<u>Device/Manufacturer/Model</u>	<u>Description</u>	<u>Est Cost</u>		<u>Status</u>
		<u>Dev</u>	<u>Unit</u>	
19. Hot-Surfaced Grenade	Thermal reaction designed to heat exterior surface of grenade, in addition to heating and dispensing anti-riot gas. Thermal reaction will begin when grenade is released. Heated surface will prevent throwback by rioters.	\$15,000	\$5.00	3
<u>New Container Materials</u>				
<u>Ethyl Corporation</u>				
20. Light Metal Foams	Closed-cell light metal foams for lightweight consumable cases for thermally disseminated CS munitions. The foams are of low-density, extremely good shock absorbers, reduce heat dissipation, and permit more payload.	10,000		2

FOR OFFICIAL USE ONLY

1. DEVICE NUMBER: A.2.1.2
2. DEVICE TITLE: Chemical Sprays and Foggers
3. PROBLEM AREA CODES: II-3.2.a, II-3.3.b, III-3.1.b, III-3.2.a, III-3.3.c
4. DESCRIPTION: Included here are various existing and proposed devices and techniques for dispensing chemical agents as fogs or liquid sprays. Suggestions for additional agents are also included. These are tabulated in Table A.2.1.2.

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TABLE A.2.1.2

CHEMICAL SPRAYS AND FOGGERS

Device/Model	Manufacturer	Description	Est. Cost		Status
			Dev	Unit	
1. MK 17 Pepper Fog CS-Tear Smoke Generator	General Ordnance Equip Corp	Projects cloud of agent up to 40 ft; ranges up to 200 ft possible under ideal wind conditions; powered by 2-cycle lawnmower-type engine; has formulation capacity of 2 one-quart cartridges at one time; operator has option of switching from one cartridge to another; output equivalent to 5 burning grenades per minute; weight fully loaded, 36 lbs.		\$300	1
2. MK XII	General Ordnance Equip Corp	More portable than MK 17 above; weighs less than 25 lbs; output equivalent to 10 burning grenades per minute; fuel capacity allows for 45 minutes continuous operation.		300	1
3. Turb-A-Fog Tear-Gas Dispenser	Federal Laboratories, Inc.	30-pound, two-cycle gasoline engine generator; dispenses agent cloud for up to 4-1/2 minutes; aerosol canister containing agent is attached to machine and activated; when canister is exhausted, operator may quickly remove it and insert another.		395	1
4. Federal Dust Projector 271	Federal Laboratories, Inc.	Small hand-held tear gas projector; small control valve permits operator to control emission rate; can be carried in one hand.		40	1
5. Dynafog 70		Commercially available insecticide fogger; easily hand-carried and operated. Operates on gasoline; uses kerosene or motor oil as smoke. CS can be mixed into smoke producing mixture.		275	1
6. Vehicular CS Disseminator	USALWL Development	Liquid agent CS is discharged by gravity feed from reservoir through motor vehicle's exhaust where agent is transformed into an aerosol form. Capable of disseminating 1 quart of material in 10 minutes.		\$4,000	2

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TABLE A.2.1.2 (Cont'd)
CHEMICAL SPRAYS AND FOGGERS

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Device/Model	Manufacturer	Description	Dev.	Unit	Status
7. Self-contained CS Dispensing System	USALWL Development	Self-contained CS-dispenser to be hidden in inaccessible location in building and automatically actuated when a window or door is broken by looters; would dispense CS for minimum of 8 hours. Standard burglar alarm could be used to actuate system; system should be tied to special telephone circuit to signal location of riot control office.		\$ 100	3
8. Controlled Evaporation of Agents	USALWL Concept	Concept envisions conversion and utilization of aircraft-mounted crop-spraying technology and equipment to disperse encapsulated noxious compound in areas to be denied; capsules would be activated when broken, and agent would be evaporated at controlled rate (by wicking).	\$85,000		2
9. Helicopter Riot-Gas Disseminators		Similar to agricultural aerial fertilizer and insecticide disseminators.	50,000		2
10. Hand-Held Pressurized Dispensers	USALWL Concept	Employ conventional air-pressurized water-type fire extinguishers to disseminate materials, such as food coloring syrup, stenchers, etc., which are identifiable but not harmful.	50		2
11. CS Sprinkler	USALWL Concept	CS Dissemination system similar to water sprinkler system that can be initiated when window breaks, door forced open, etc. that consistently sprays CS.	100,000		3
12. Demountable Anti-Riot Gas Dispenser		Canisters with screw-on adapter to fit a socket inside a commercial establishment could be activated remotely; could be used in normal electrical socket, and activated by switching on light at night; could be removed for safety during periods of normal operation.	10,000		2

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TABLE A.2.1.2 (Cont'd)

CHEMICAL SPRAYS AND FOGGERS

Device/Model	Manufacturer	Description	Est. Cost Dev.	Unit	Status
13. CS Canister	USALWL Development	A slowly discharging thermally disseminated, CS canister placed near possible target and triggered by rioter on way to target.	\$25,000		2
14. Pick-Axe Tear-Gas Dispenser	Federal Laboratories, Inc.	Tear-gas dispenser in shape of pick-axe, can be pounded through wooden door and release its agent into a building; head of dispenser is pointed and connected to gas reservoir via a reinforced tube.			
<u>Individual Chemical Spray Devices</u>					
15. MK II Pocket Projector	General Ordnance Equip Corp	Capacity, 8 one-second bursts; operates in range of 8 to 10 ft.	\$ 4.50		1
16. MK IV Chemical MACE	General Ordnance Equip Corp	Fires a shotgun pattern of heavy droplets of a special liquid CN formula 15 to 20 ft, and averages 50 one-second bursts.			1
17. MK VII Chemical Baton	General Ordnance Equip Corp	Chemical Baton available in three different lengths: (1) 12-inch baton (2) 20-inch baton (3) 26-inch baton	13.50 16.00 18.50		1 1 1
18. MK IX	General Ordnance Equip Corp	A refillable replacement kit is also available for the MK VII Chemical Baton for \$6.00. Greater capacity, higher flow rate, and longer range than MK IV; range, up to 30 feet; gross weight, 700 grams; net weight, 520 grams; length, 8-3/8 inches; diameter, 2-1/2 inches; with 37 one-second bursts.			1
19. Model 140	Partner Industries of America, Inc.	Capacity, 40 one-second bursts; effective range, up to 20 feet; length, 6-3/8 inches; diameter, 1-1/2 inches; gross weight, 147 grams; net weight, 104 grams.		6.50	1

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TABLE A 2.1.2 (Cont'd)

CHEMICAL SPRAYS AND FOGGERS

Device/Model	Manufacturer	Description	Est. Cost		Status
			Dev.	Unit	
20. Model 108	Partner Industries of America, Inc.	Capacity, 8 one-second bursts; effective range, up to 6 feet; length, 4-3/8 inches; diameter, 5/8 inches; gross weight, 25.5 grams; net weight, 9 grams.			1
21. Curb 60	Port O ₂ Matic Sales Corp	Capacity, 60 two-second bursts; range, 15 to 20 feet; net weight, 12 ounces.			1
22. Police Model AP-18	Penguin Associates	Stinger aerosol pressurized stream; capacity, 70 one-second bursts; range, up to 20 feet. Recommended for selective use against an individual.			1
23. Police Model AG-12	Penguin Associates	Stinger aerosol pressurized stream; capacity, 70 one-second bursts; range, up to 20 feet. Recommended to quickly disable several opponents.			1
24. Penguin's 10-4 Chemical Billy AG-20	Penguin Associates	Provides stream of CN			1
25. HELP	J. M. Sales, Inc.	Tear gas tank, capacity one gallon; comes complete with harness; tanks, controls, and sprayer; replacement refill tanks are available for \$70.	\$ 135		
26. Tear Gas Streamer No. 280	Federal Laboratories, Inc	Capacity, 50 to 75 bursts; effective range, up to 20 feet; effective duration, 15 to 20 minutes; (In addition to listed cost of streamer, holster cost is \$2.00).		8.45	1
27. Tear Gas Mini Streamer No 282	Federal Laboratories, Inc	Capacity, 30 to 35 bursts; effective range, up to 14 feet; effective duration, 15 minutes.		4.95	1

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1. DEVICE NUMBER: A.2.1.3
2. DEVICE TITLE: Liquid Chemical Dispenser
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: At present, the U. S. Army utilizes a back-pack flame-thrower device (XM33) which dispenses dry CS for short distances. Disadvantages of this system lie in the facts that a dry agent is greatly subject to wind effects and is quite limited in range.

The proposed system would be similar to these flame-thrower type devices except that it would dispense a liquid that contains a non-lethal chemical agent. It would be a man-portable, pressurized, liquid dispenser capable of dispensing liquid up to a distance of approximately 120 feet. The distance of projecting a liquid stream would be controllable for the application at hand. Provision should be made for remote-control operation when mounted on a police van which is used to transport detainees, or on other types of inclosures. This would provide a means of controlling those within the van. In addition, the device might be mounted on helicopters for overhead control of crowds. A marking agent could be added to the basic liquid to provide a method for identifying rioters.

5. COST: \$7,500 for development; \$150/item
6. STATUS: 2

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1. DEVICE NUMBER: A.2.2.1
2. DEVICE TITLE: Smoke Grenades
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DISCUSSION: This category includes commercially available and conceptual chemical grenades for dispensing smoke-producing agents for obscuration purposes. In addition, a new agent container material is suggested. These are presented in Table A.2.2.1.

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TABLE A.2.2.1

SMOKE GRENADES

Device/Mfr/Model	Description	Dev	Est Cost	Unit	Status
<u>SMOKE GRENADE</u>					
Penguin Associates					
1. Penguin HC-1	Metal canister, generates about 160,000 cu ft of dense smoke.		\$ 7.95		1
2. Penguin HC-3	Smoke candle, generates about 8,000 cu ft of smoke, 1-minute burning time.		1.95		1
3. Penguin G-3	Metal canister with standard military fuze, also available loaded with CN, CS, or DM.		9.95		1
4. Superior Signal Company					

	Can be hand-held or thrown; 3-minute burning time; generates 120,000 cu ft of white smoke.				1
The following variational forms were included under A.2.1.1 but are applicable here also.					
5. Spinning Gas Grenade	Anti-riot grenade with delivery orifices so designed and placed that high-velocity exit gases cause grenade to spin wildly and, thereby prevent throwback by rioters. Asymmetric distribution of weight will randomize motion.	\$25,000	5.00		2
6. Anti-riot Dispensing Tetrahedrons	A simple plane-sided grenade, such as tetrahedron or cube, is desirable. Such a grenade would tend to remain at the point to which it was thrown and not roll out of effective range.	1,500	5.00		2
7. Hot-surfaced Grenade	Thermal reaction designed to heat exterior surface of grenade, in addition to heating and dispensing anti-riot gas. Thermal reaction will begin when grenade is released. Heated surface will prevent throwback by rioters.	15,000	5.00		3
8. Non-container materials Ethyl Corporation Light Metal Foams	Closed cell, light metal foams for lightweight consumable cases for thermally disseminated CS monitors. The foams are of low density extremely good shock absorbers, reduce heat dissipation, and permit more payload.	10,000			2

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1. DEVICE NUMBER: A.2.2.2
2. DEVICE TITLE: Smoke Generator
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: Non-toxic, non-irritating and non-corrosive smokes may be required under certain conditions of riot control. There are several ways to disseminate smoke depending on the restrictions and requirements of the problem. Some examples of recent developments of means for generating non-toxic, non-irritating and non-corrosive smoke are described in Table A.2.2.2. However, the most promising smoke generator agents at present are oil smokes.
5. MODIFICATIONS: Experimental formulation of air-reactive colored smokes and chemiluminescent smokes employing metal-organic compounds are currently being investigated by Ethyl Corporation, USALWL, USNAD-Crane and Picatinny Arsenal, among others. Smoke of this type is still in the developmental stage. Innocuous smokes are required for use in civil disturbances. Additional modification by creating colored smokes with inorganic and organic dyes may be appropriate and pertinent to riot control. Recent studies indicate that titanium tetrachloride (TiCl_4) has promise as a smoke agent when colored with appropriate dyes such as chromyl chloride and vanadyl chloride. The resulting smoke has the advantage of producing less toxic smoke than agents which give H_2SO_4 as a product, such as the SO_2 , Oleum, and chlorosulfuric acid smokes. Other applicable materials include air-reactive white phosphorus colored by a 30/70 mixture of methylene iodide to produce a violet smoke. Such a smoke is toxic, however, and development work is needed to produce an appropriate color for phosphorus smoke.
6. COST: \$80,000 for development; \$6.00/item.

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TABLE A.2.2.2

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SMOKE GENERATORS

Mfr./Model	Description	Wt	Size	Dev	Est Cost	Unit	Status	Comments
1. Integral Smoke Generator, Airborne	The integral smoke generator system consists of a tank, pump, plumbing, electrical control, and a nozzle assembly. The tank system is mounted on the UH-1 type helicopter such that the nozzle assembly feeds oil into the exhaust stack of the turbine engine upon command. The hot exhaust gases immediately convert the liquid fog oil into a voluminous smoke cloud which falls rapidly to the ground.						1	This system is being employed operationally in RVN for securing landing zones and Medevac operations. One system for test and evaluation in a riot control role is currently available at LWL App Chem Br.
2. Vehicular Smoke Generator, Pot	A harmless oil smoke screen is produced from the exhaust system of any available motor vehicle by the introduction of 10. SAE-10 oil into a reservoir which feeds into the exhaust manifold. The oil is vaporized and is disseminated through the vehicle's tail pipe as a heavy smoke screen.					\$150	1	One prototype for test and evaluation available 30 June 1968 at LWL App Chem Br.
3. Superior Signal Co. Spotswood, N. J.	The smoke generator is fuzed so that it can be lighted from either end. If several are tied together, as one goes out, the next one in the series is lit automatically. In this way, a whole series of smoke generators can be put in place either end-to-end or in clusters which permit a continuous unattended discharge of smoke. Each unit releases about 100,000 cubic feet of smoke and will burn for five minutes.						1	Available.
4. Dynafog 70	Commercially available insecticide fogger which is easily hand-carried and operated. Operates on gasoline. Uses kerosene or motor oil as smoke.					275	1	

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1. DEVICE NUMBER: A.2.3
2. DEVICE TITLE: Immobilizing Agents
3. PROBLEM AREAS: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: There exist several basic techniques designed to immobilize individuals. Some of these employ agents which decrease friction between the shoe and the ground surface so that it is impossible for an individual to walk; others, such as foams, actually impede mobility; and a third would immobilize an unruly person if the agent were sprayed on his clothing. The characteristics vary and can be tailored for the environmental conditions prevailing at time of use. In addition, the agent must be easily removable and leave no harmful residues. These basic approaches are described in Table A.2.3.
5. MODIFICATIONS AND OPTIONS:
 - a. Incapacitating Agents
 - b. Marking Agents
 - c. Obscuration

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TABLE A.2.3

MECHANICAL CHEMICAL DEVICES

Mfr/Model	Description	Wt	Size	Est Cost		Status	Comments
				Dev	Unit		
1. Immobilizing Agent	Water-soluble chemicals which will harden rapidly on clothing or skin, thereby impeding movement of target personnel; could be included in the reservoir of small fire trucks.			\$50,000		3	USALWL App Chem Br, Concept stage.
2. Anti-Friction Spray	Natural lubricating oils could be sprayed on the rioters and on street surfaces so that street surfaces become slippery and rioters cannot remain standing.			50,000		2	USALWL Mobility Branch
3. Low-Friction Polymers	Various low-friction polymers (Teflon) and slippery liquids (Slippo) are commercially available. If the coefficient of friction is reduced below 0.5, walking becomes progressively more difficult and a slippery floor effect can be created on pavements and sidewalks.			15,000		2	USALWL Environment & Survival Branch - Ten weeks to experimentally examine optimum substances, dosage, method of dispensing and decontamination techniques.
4. Instant Mud	A concrete mixer could be used in conjunction with a pressurized dispenser.			7,500		3	
5. Instant Banana Peel/Western Co, Dallas, Texas	Non-toxic white powder known as Rio-Trol is dusted onto a surface, then watered down. The powder then turns into a thick paste, fills in the rough spots in a sidewalk or street and forms a slick film. The result is a patch of pavement that is almost too slippery to stand immobile on and almost impossible to move across.		1 lb/500 sq ft			2	May hinder emergency operations.
6. Foam Projector	The ingredients are mixed and maintained at high pressure by the pump and accumulator. The product is expelled through a nylon mesh screen to produce foam. At maximum pumping rates, units are advertized to produce 5000 cu ft of foam/minute.		Unit consists of 350-gal agent tank; 1000-gal water tank; 5-gal detergent.	\$2,000		1	

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TABLE A-2.3 (CONT)

MECHANICAL CHEMICAL DEVICES

Mfr./Model	Description	Wt	Size	Est Cost		Status	Comments
				Dev	Unit		
7. Nat'l Foam Systems, Inc., West Chester, Pa./Bubble Generator	Device would be a high-volume disseminator of heavier-than-air bubbles that would serve to obstruct crowd movement by obscuring the street, limiting visibility, and producing a slippery surface.				\$500-800	2	Newly developed item, not yet used in riot control.
8. Walker Kidde & Co., Belleville, N.J./Model P-500	The machine, portable or mounted on a truck, blows air through a nylon net kept wet with a mixture of foam concentrate and water to quickly produce a large volume of foam which will last from 5 to 10 minutes. Cl, marking dyes, smoke-producing materials, water-gelling agents, and antifriction substances could be added to the formulation.	180 lbs	61"x41"x41"			1	Commercially available
9. Nat'l Foam Sys., Inc. Model GP-7J WP-25 EP-30	165 lbs 56 lbs 78 lbs						
10. Foam Generator	High-volume foam generators are commercially available.			\$15,000		1	USFAL env & Surv Dr - 12 weeks to determine final system characteristics.
11. Thermocapture	Concept involves thermosetting plastic sprayed by hose or splattered by canister on the arrestee. The plastic would begin to set making movement by the arrestee increasingly difficult.			\$20,000		3	A number of adhering viscous, non-toxic, thermosetting plastics form suitable candidates. Hazardous to eyes.
12. Instant Jungle	Could consist of a large projectile filled with a quick-setting gel and a small amount of explosive. Should form an effective barricade.			\$30,000		3	No known current effort, technology may not be available. Uses explosives.
13. Instant Cocoon	Plastic spray which sets quickly to tough pliable membrane is available. Such a spray could be used on rioters to immobilize, and if necessary, encapsulate them from the neck down.			\$ 7,500	\$100	3	Technology is adequate. Demonstration and field test might require two months.

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1. DEVICE NUMBER: A.3
2. DEVICE TITLE: Water Cannon
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: Water cannons are now extensively used. The USALWL has investigated the feasibility of their use against structures on-shore in Vietnam. French and Japanese police have also used high-pressure streams of water to disorganize mobs, and the Germans in World War II had developed water cannons.

A proposed system would consist of a truck- or trailer-mounted high-pressure water pump with driving motor (electrical or internal combustion), high-pressure hoses, and nozzles for use with Army water trucks. The device may be used against both people and inanimate objects, and therefore provision must be made for variable water pressure or assorted nozzles. A very high pressure, which would be lethal when used against people, is necessary for destruction of building walls or to get at a sniper. The purpose is to provide economical capability and to avoid association with fire departments.
5. OPTIONS: Marking agents may be added to the water.
6. COST: Some units, estimated \$10,000. Feasibility demonstration of smaller version strapped on a standard Army caisson-type water tank unit, \$20,000, with the unit cost being \$300/unit; a very high-pressure wood or metal-cutting type would be approximately \$10,000 for a demonstration model and a maximum of \$5,000 for an operational device.

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1. DEVICE NUMBER: A.4
2. DEVICE TITLE: Sound-Producing Devices
3. PROBLEM AREA CODES: I-3.2.a, II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: Sound can be utilized to produce certain effects by various techniques, e.g., high intensity at various frequencies. The French have experimented with very low-frequency, very high-intensity sound. Discomfort, disorientation, and other physiological effects may occur with use of these intense sound fields. Table A.4 lists three representative devices of this type.

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TABLE A.4
SOUND-PRODUCING DEVICES

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Mfr./Model	Description	Wt.	Size	Est. Cost		Status	Comments
				Dev.	Unit		
1. Coit Pyrodynamic Division/"Teleshot"	This device is a cartridge, which is used to control bird damage to aircraft and farm crops. The cartridge projects a powerful sonic device approximately 200 yards. The device functions in the air and provides a loud noise, a flash and a small cloud of smoke. The cartridges are bore-safe. They can be fired from semi-automatics over the heads of crowds and would be non-lethal. They are commercially available.		12 gauge shotgun			1	
2. Very Low Frequency Sound U.S. Air Force Dynamic Pressure Chamber	Infrasonic energy generator to induce both physical and physiological effects.			\$25,000	\$2,500	3	Resulted from French experiments. Has not been proven.
3. Astrosystems International, Inc	A high-intensity sound generator, consisting of two hot gas intersecting jets, produces an overall sound pressure level of approximately 126 db at 500 feet, with most of the energy between 2.5 CPS and 80.					3	Prototype produced in 1966, but present availability is unknown.

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1. DEVICE NUMBER: A.5
2. DEVICE TITLE: Heat Production
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: The application of heat to create extreme discomfort is a relatively untried approach in riot control. Although various heat producing devices are possible, a flameless heat gun is suggested here as a promising device for effecting control through heat while at the same time avoiding the undesirable signature of flame.

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TABLE A.5

HEAT-COLD DEVICES

Mfr./Model	Description	Wt	Size	Est Cost		Status	Comments
				Dev	Unit		
1. Master Appliance Corp Racine, Wisconsin	A heat gun to deliver up to 1000°F without danger of open flame. Used for emergency heating of field stations or for flushing out barricaded rioters from enclosed areas.	5 lb	115/230V, 9/20 Amps battery- operated device should be provided.	\$10,000	\$60-70	2	Possible injury from direct blast.
2.	Low-temperature flame or hot gas dispensers could be used to cause extreme discomfort to rioters. 120-180°F range.			\$15,000		2	Technology adequate; 6 months time to attain operational status.

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1. DEVICE NUMBER: A.6
2. DEVICE TITLE: High-Intensity Light Sources
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: Light sources or techniques to impair the vision of rioters which have been proposed are listed in Table A 5.

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TABLE A.6
LIGHT SOURCES

Mfr./Model	Description	Wt	Size	Est. Cost		Status	Comments
				Dev.	Unit		
1.	Bright-light Mob Dispersal. High-intensity light directed toward a mob during hours of reduced light could be an effective device for dispersal. The necessity of avoiding light with the eyes would cause mass confusion and subsequent dispersal. Light source would be a reflector-equipped handheld candle holder, similar to the Battlefield Illumination System narrow frequency light source. Used for purpose of destroying night vision.			\$	400	2	Available as of Jan 70. USALWL Munitions
2.	Manipulation of street lights in patterns. This is a suggestion for manipulation of street lights to drive individuals from a darkened place to light.					3	No known hazards.
3.	Disorienting Holograms. Large, reconstructed volume holograms can be used as disorienting devices in riot situations. They can project larger-than-life images above eye-level that look three-dimensional. With variations in technique, can project several images of different colors starting from the same original object.			\$40,000	10,000	3	Hazard - might cause crowd to panic.
4. Varo Mfr Co.	Xenon searchlight. Area illumination and visual impairment using a high-intensity searchlight. It is a lightweight, mobile unit which provides a narrow or wide beam of high-intensity light. Can be overdriven for 15 to 20 seconds to 50% increase in intensity. It is available for use on tanks, helicopters or in a universal mount for various vehicles.	240 lbs				1	Operates on 28 volts D.C. Output 100 million CP. May be increased to 150 million for short periods. Available.

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TABLE A.6 (Cont'd)
LIGHT SOURCES

Mfr./Model	Description	Wt	Size	Est. Cost Dev.	Unit	Status	Comments
5. Spectrola Company	Night-sun X-16 helicopter searchlight for illumination of ground area from a helicopter. Unit incorporates 1600 watt xenon searchlight. Features remote-control from the cockpit.	Less than 25 lbs.				1	Commercially available.
6. Electro-Optical Systems	Minilight. This searchlight is a portable or airborne target illumination device.	19 lbs, includes 15 lb battery pack	8"x10"			1	Beamwidth adjustable between 1 and 5 degrees. Peak intensity - 3 million CP. Available. Operates on 12 to 28 volts DC with a one-hour battery charge.
7. Carpenter Mfg Company	This is an all-purpose riot light. The light projects a 50,000 CP light beam for about 1/2 mile. It will operate from a vehicle electrical system or from a portable battery pack.	Less than 2 lbs.				1	Commercially available.

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1. DEVICE NUMBER: A.7
2. DEVICE TITLE: Insects
3. PROBLEM AREAS: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: The release of obnoxious insects to cause discomfort to a mob has not been utilized or developed to date. In order to be operationally effective, it appears that the crowd should be "treated" with some sort of "bait" or attraction agent. Development of such a technique may require only proper choice of bait and insect species.
5. STATUS: 3

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1. DEVICE NUMBER: A.8
2. DEVICE TITLE: Electrical Shocking Devices
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: The basic principle of these devices is the production of an electrical potential capable of inducing a non-lethal reaction in a rioter, thus causing him to withdraw from his position. The electrical charge should be sufficient to produce this temporary effect, but insufficient to produce lasting or lethal effects. Several such devices are listed in Table A.8.

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TABLE A.8

ELECTRICAL DEVICES

Mfr./Model	Description	Wt	Size	Est Cost		Status	Comments
				Dev	Unit		
1. Multiple Cattle Prod Boom	A boom fitted with multiple cattle prods attached to a tractor-mounted telescoping arm. Its purpose would be to sweep street area of crowd.			\$15,000	\$ 1,000	2	No known development effort. Industrial design only required.
2. Electrified Water Jets	High-voltage, low-power electrified jets would shock crowd approaching or being approached by dispenser. Dispenser could be transported manually or could be part of anti-riot vehicle.			6,000	75	2	Technology fully developed. Minimal hazard, but could endanger vital organs such as eyes.
3. Extended Electrified Boom w/ Vehicle	A vehicle with extensions which reach from curb to curb is being used by riot control forces in West Berlin. The rioters touching the vehicle receive an electrical shock. The carrier vehicle is a modified armored personnel carrier. The boom is a fence-like fitting on the front which extends a foot past each side of the vehicle. Attached to each end is a section which folds back about 3/4 of the length of the vehicle and may be swung forward to present a barrier.				10,000	2	Serious injury can result from use. Prototype developed.
4. Shok Baton Co. Minn, Minn. Models RI, PB, RIC, MRC, MR Scope, Inc. Reston, Va.	Several police batons of standard dimensions have been developed with the capability of delivering a relatively harmless electric charge of low amperage and high voltage. The Shok baton is powered by three to seven standard, type C flashlight cells that deliver a harassing shock. No current of electricity passes thru the skin. The effect, felt only at point of contact, is similar to a bee sting, but not nearly as dangerous.	2-1/2-3 lb	16-36" long		24.95 to 32.95	1	Shok Baton items are currently available.

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1. DEVICE NUMBER: A.9
2. DEVICE TITLE: Miscellaneous Items for Civil Disturbance Control
3. PROBLEM APEA CODES: II-3.2.a, III-3.1.b, III-3.2.a
4. DESCRIPTION: A series of mechanical and physical devices which have been or could be developed to aid in riot control are listed in Table A.9.

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TABLE A.9

MISCELLANEOUS DEVICES

Mfr/Model	Description	Wt	Size	Est Cost		Status	Comments
				Dov	Unit		
1. General Electric	A mechanized man-robot ("Hardiman") is being developed under joint Army-Navy sponsorship. It will allow a man to push, pull, manipulate, walk, lift, climb with a load to 1500 lbs. An external skeleton with mechanically powered muscles fits over the operator's body.					2	Use may induce violence. Under development with no estimate of time required to reach operational status.
2.	The "Man-Horse" uses 2-way cybernetic control to perform superhuman feats of strength. Can be equipped for remote control and manipulation of the device.					3	Use may induce violence. Under development but no estimate of time to operational status.
3.	A break-away night stick. A baton which breaks apart if used too vigorously or improperly. Non-isotropic materials are used so that the club has strength when used in one direction but is weak when used in the other.			\$ 8,000	\$ 10	1	Materials available. 3-4 weeks to operational status.
4.	Foldable, antenna-like baton. A Japanese billy club design is mentioned by J. Coates of IDA as consisting of three thin-wall tubular telescopic sections which can be extended quickly into operational position and locked in place.				\$ 20	1	Available in Japanese version.
5.	One method of temporarily incapacitating a group of rioters would be to project a filamentary net over their heads. This net would be composed of many single lines which would be simultaneously fired from two vehicles spaced so that the lines interlace.	250 lbs/system	50 lines from each vehicle		\$2000/system	3	Range 200-300 feet. USALWL Munitions Branch.

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TABLE A.9 (CONT)

MISCELLANEOUS DEVICES

Sfr/Model	Description	Wt	Size	Est Cost		Status	Comments
				Dev	Unit		
6.	Nets have been used by police in other countries. Any methods which allow for a person to be apprehended or which divide large groups into manageable smaller groups should be considered in riot control. Many types of nets are available. Techniques could be quickly worked out for delivery by hand or from the air.			\$10,000		2	Eight weeks required to review available nets and to define use concepts and method of employment. USALWL Env & Surv Branch.
7.	Net-throwing device. Nets may be used to subdue, with minimum force and danger to the arresting police, belligerent agitators who seek a confrontation with police to express brutality.			\$20,000	\$ 40	2	Individuals could be injured by momentum of nets. Nine months required to operational status.
8.	Projectile with fly paper. Mylar/dispenser and adhesive nose is designed to be fired against a building.			\$15,000	\$1-2	3	Projectile could cause injury or property damage. Time required to operational status - 6 months.
9.	A miniaturized, pulse-jet, radio-controlled aircraft (Mechanical Bee) could be used to herd or limit movement of mob. Hypodermic needle would paralyze when it crash-strikes selected victim.			\$ 1,500	\$ 15	3	Dangerous if victim is struck in the face. 4 months to operational status. All elements available.
10.	High-velocity air blasts have been used by the French in anti-riot operations. The units are essentially small aircraft engine-propeller combinations. Possible variation could include heated air and a stream of water directed into the air blast to form a drizzle to be directed onto the rioters.				\$500	2	Danger of contact with propeller unless shielded. Technology fully developed.

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TABLE A.9 (CONT)

MISCELLANEOUS DEVICES

Mfr/Model	Description	Wt	Size	Est Cost		Status	Comments
				Dev	Unit		
11. DuPont Explo Corp of America Atlantic Res Corp Unidynamics Naval Ord Lab Franklin Institute Frankford Arsenal	A demolition kit safe for use under adverse- environment field conditions of impact, heat, temperature, stray electricity, friction, radio frequency energy, humidity and crushing. It is less sensitive than the standard dynamite cap. Specific solutions include exploding bridge wires, semiconductor initiators, hypogolite mixtures as detonators, water and high explosives sensitized by water, metal-metaloxide initiators, new primary explosive, laser-fiber optics detonator. Alternative concepts to replace the blasting cap or render it safer are: containment, out- of-alignment devices, separation with con- tainment, separation with inert compounds, increasing firing ampereage threshold, and use of carrier vehicle.			\$15,000 - \$100,000		2	Destruction of barriers built by rioters. Hazard: introduces explosives into riot situations. Time to attain operational status - 3 months to 1 year.

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1. DEVICE NUMBER: B.1
2. DEVICE TITLE: Mechanical Barriers
3. PROBLEM AREA CODES: II-3.2.a, II-3.3.a, III-3.1.b, III-3.2.a, III-3.3.a, III-3.3-b, III-3.3.c.
4. DESCRIPTION: There are several types of mechanical barriers useful in controlling movement of a crowd, blocking off areas, or providing protection to display windows. Table B.1 lists a number of proposed items.
5. OPTIONS: Metal barriers to protect store display windows may be charged electrically.

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TABLE B.1.

MECHANICAL BARRIERS

Mfr./Model	Description	Wt.	Size	Est. Cost Dev.	Unit	Status	Comments
1.	Rapidly erected barriers are needed to prevent entry and vandalism of public buildings and utilities and to prevent looting of stores. A nylon barrier could be used as an ensnarement device. The nylon roping would be dispensed by means of an "Archolithic Gun" using a portable air compressor mounted on a 1/2 or 3/4 ton vehicle. The air compressor should have a minimum capacity of 30 cubic feet/minute at 100 psig pressure.			Archolithic Gun (\$500) Rental of Compressor (1 week - \$8,000) Nylon - 50¢/lb. \$5,000 f/5 systems		2	Material commercially available. No more than 30 days lead time. 5 sys ready 60 days after authorization. USALWL App Chem Br
2.	A method is required to afford protection to property such as plate glass display windows of stores. The proposed device is a standard metal barrier placed over the windows to deter breaking and entering. It is proposed that this barrier be charged with a low voltage similar to that used in electric fencing. The energy will not be drawn from the property electrical system but be supplied by an auxiliary device and have the capability of being command initiated.			\$1,500		1	USALWL Munitions Branch
3.	Expedient barriers are used to assist in controlling crowds and to establish shut-off lines. A typical barrier is made of wooden planks supported by wooden legs which could be used to control an orderly crowd. Instead, a general purpose barbed obstacle which consists of a helical spring steel-tape compressed to a closed coil and packaged within a polyurethane foam container. There is sufficient tape to form a 76 ft barbed entanglement 30 inches high. A rapidly emplaced anti-personnel obstacle consists of a barbed tape wound in a reel approximately 6" in diameter and		Plank 40" above ground level			2	Several types of tapes have been evaluated at Ft. Belvoir, Virginia

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TABLE B.1. (Cont'd)
MECHANICAL BARRIERS

Mfr./Model	Description	Wt.	Size	Dev. $\frac{\text{Est. Cost}}{\text{Unit}}$	Status	Comments
4.	(Cont'd) a clam-shell type shipping container containing 12 reels. The energy for tape erection comes from the recoil action of a gun, accommodating a standard 7.62 mm Nato cartridge which may be employed to anchor the tape in the ground. In the early stages of a riot, it is important to keep the riot from spreading. Hasty barricades are required to control foot and vehicular traffic, coils of wire could be carried in a trailer and dispensed from a container by spring action similar to that of a "Slinky-Toy."			\$50,000	2	USALML Mobility Br. Available in 6 mos.
5. Frankford Arsenal	A wire gun to rapidly emplace a barrier to barricade a street or alley. The wire gun is a cylinder containing a coil of barbed, high strength, rectangular steel wire. The wire is coiled in the container and still under tension. When the coil is released, energy propels the wire out of the tube to a distance of 80 feet.		450 ft		2	Frankford Arsenal developed prototype. Evaluation tests on several types conducted at Ft Bragg, N.C.
6. Rohm and Haas Co.	Acrylic Plastic (Plexiglass) shield placed behind conventional plate glass windows to withstand heavy impact. Available in various thicknesses and sizes which may be easily cut and installed.				1	Has been successfully utilized in crime control.

1. DEVICE NUMBER: B.2
2. DEVICE TITLE: Shielding Materials
3. PROBLEM AREA CODES: II-3.3.b, III-3.3.c
4. DESCRIPTION: Shielding devices can be made up of various materials, each with its own protective effectiveness and operational advantages and disadvantages. Various types which have been proposed for riot control applications are listed in Table B.2.

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TABLE B.2
MATERIAL SHIELDING DEVICES

Sfr./Model	Description	Wt.	Size	Est. Cost		Status	Remarks
				Dev.	Unit		
1. Grids	Foam Barricade Foam barriers would be placed by hose. They would consist of quick-setting foam so that a barrier of several feet in height and perhaps the same thickness could be built up quickly.			\$75,000	\$2,000	3	Several candidate materials are available. Estimate 1 year to attain operational status.
2. LWL Concept/Mass Protective Shield	A method is required to contain crowds and to prevent crowds from pushing against or breaking through police lines. The proposed device will have an interlocking feature so that adjoining shields can be locked together and form a continuous wall.		2-1/2 - 3' wide 4-6 ft high mine feeds of 3/8" ply-wood	\$5,000	to determine	2	Demonstration models available 4 weeks after start of work. LWL Mobility Branch
3. Concept	Riot Control personnel riding in open jeeps are in danger of injury from thrown rocks, bottles and other missiles. It is suggested that a tough wire mesh net covering a rigid aluminum frame which can be easily employed on a jeep be developed. The device might be made in a curved form.			\$	500	1	
4. Helicopter Shielding	A bullet proof shield for protection for helicopters is desirable. The armor placed in the lower portion of the helicopter fuselage would provide for protection of the crew from sniper fire.			\$15,000	\$2,500	2	Requires system engineering, analysis and tests. 3 mos to 1 year may be required to reach operational status.
5. Great Lakes Steel Corp./AR 30 Steel Armor	Modular armor for patrol vehicles with protection against non-ballistic threats and ballistic threats up to and including caliber .30 M2AP projectiles is needed.	300 lbs for 3x5' panel			35c to 50c/lb	1	In production and available on order.

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TABLE B.2 (Cont'd)

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MATERIAL SHIELDING DEVICES

Mfr./Mod.	Description	Wt.	Size	Est. Cost		Status	Comments
				Dev.	Unit		
5. Aeronutronics Div Philco-Ford Co./DPSA Armor	Modular armor for use on patrol vehicles against non-ballistic and ballistic threats up to and including caliber .30 M2AP pro- jectiles.	180 lb for 3x5 ft panel			\$5/lb	1	In production and available on order.
7. PPG Industries, Inc/ Safetee Glass	Safety glass for protection of vehicles against fragments and low-energy hand gun projectiles. Safetee glass is pro- duced in a number of sizes and thicknesses.					1	Available on order.
8. Rohm and Haas Co.	Acrylic Plastic (Plexiglass) shield for security forces and fire vehicles.					1	Acrylic plastic shields have been adapted to police cars, fire trucks and store windows.
9. LWL Concept/Patrol Vehicle Shield	Pre-formed shield of ABS (Roxalex) plastic to provide protection against thrown missiles. Shield could be quickly installed.					2	Under development at USALWL.

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1. DEVICE NUMBER: B.3
2. DEVICE TITLE: Individual Protective Devices
3. PROBLEM AREA CODES: III-3.3.a
4. DESCRIPTION: A variety of protective devices for individual use can be developed provided the threat is well-defined. The items presented in Table B.3 are based on the best current estimate of the threat. In addition to the listed items, a wide variety of standard Army equipments are available.

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TABLE B.3

PERSONAL PROTECTION EQUIPMENT

Mfr./Model	Description	Wt	Size	Est Cost		Status	Comments
				Dev	Unit		
1. Concept/Tenebrific Goggles	Goggles which vary opacity in proportion to the intensity of light to which exposed could be used by anti-riot personnel during darkness in conjunction with flashing light sources. Light sources would destroy night vision of anti-riot personnel.					3	No hazards. Tenebrific material suitable for this task is not yet available. No estimate of cost nor time to reach operational status.
2. Concept/Filter Goggles	Narrow frequency filter goggles would be used in conjunction with mono or narrow frequency light source. A flashing light could be employed to delay or destroy adaptivity of the unprotected eye to darkness while not affecting eyes covered with filter goggles.			\$ 2,500	\$ 3.50	3	Six months.
3. LML Concept/Body Armor	Police, the military and firemen are often targets for thrown bottles, bricks and other missiles and are sometimes subject to rifle fire. At least 16 firms are currently manufacturing protective equipment commercially ranging from see-through riot shields, and ballistic body armor to bullet proof shields and riot-disaster helmets.			2,500		1	Items are commercially available. Eight weeks required for evaluation.
4. LML Concept/Body Pads	Body protection in the form of lightweight body pads may be worn under regular clothing to give some degree of protection to legs, arms, and chest. Riot control personnel thus equipped will not become special targets of the mob.			10,000		1	Available within 5 months.

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TABLE B.3 (Cont'd)

PERSONAL PROTECTION EQUIPMENT

Mfr/Model	Description	Wt	Size	Est. Cost		Status	Comments
				Dev.	Unit		
5. LML Concept/ Plastic Body Armor	Lexan plastic body armor, a high-impact, light, transparent, 1/4" plastic, capable of stopping .22 cal round. It will provide protective cover for the face and other parts of the body.				\$ 10 (face mask)	1	Material now available. Production equipment could probably be produced in quantity 6 months after proto-type.
6. Concept/Shoulder Supported Helmet	A shoulder-supported helmet, decoupled from the wearer's head may be effectively used to counter high energy ballistic threats which might be lethal to an officer wearing the normal type helmet.			\$20,000	150	1	3-6 months estimate to reach operational status.
7. Concept/Protective Shields	Protective shields should offer protection to officers from thrown objects. They should be fairly large, light in weight and preferably transparent. An alternative shield would provide protection against high velocity rifle fire.				50-150	2	Many types are now available. 6 months estimated time to attain operational status.
8. Concept/Modular Body Armor	Light weight modular body armor which can be removed from and added to basic armor to meet varying threats might be desirable.			15,000	150	2	1 year estimated time to attain operational status.
9. /Crash Helmet	A plastic helmet similar to those employed in aviation. The advantages of plastic over metal include reduced weight and increased shock resistance. Helmet design could incorporate sliding goggles, radio transceiver and fittings for quick release gas mask.			10,000	40-100	1	Approximately 8 months to attain operational status.

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TABLE B.3 (Cont'd)

PERSONAL PROTECTION EQUIPMENT

Mfr./Model	Description	Wt	Size	Est. Cost		Status	Comments
				Dev.	Unit		
10. Carborundum Co./ Law Enforcement Body Armor	The Carborundum Co. has produced a line of ceramic body armor which will protect men from projectiles in the velocity range of .30-06, .357, etc. Their "K1" ceramic armor vest, covers the front, back and groin and reportedly will protect the wearer against rifle ball ammo at point-blank range. The basic components of these vests is a hard ceramic backed by Doron, a fiber glass, and inserted into the vest.	23 lbs		\$495	1		Carborundum's item became available to law enforcement officers in 1967.
11. Davis Aircraft Products Co/ Model 6003-1	Davis Aircraft Products Co. manufacturers a line of vests reportedly effective against non-ballistic fragments, high velocity semi-jacketed .357 magnum, .44 magnum and 9 mm parabeillum, as well as slugs, 00 and #4 buck shot from a 12 gauge shotgun. Model 6003-1 vest. The vests are a Hadfield steel plate/nylon felt combination.	14-1/2 lbs		125	1		Davis Products item is not yet optimized.
12. Federal Labs, Inc./ Model P	Lightweight bullet-resistant body armor will decrease the threat of sniping to riot control forces. The Federal system is designed to reduce the threat of handgun bullets up through .357 Magnum. The Model P vests provide protection to torso and crotch from front, back and rear. Constructed of overlapping armor plates sewn into nylon pockets, the vest is flexible and capable of withstanding handgun bullets with a velocity up to 1430 ft/sec. Other lighter weight vests are available to be worn underneath clothing and are capable of stopping .38 special bullets.	Model P - 16-1/2 lbs			1		Available at present time.

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TABLE B.3 (Cont'd)

PERSONAL PROTECTION EQUIPMENT

Mfr./Model	Description	Wt	Size	Est. Cost		Status	Comments
				Dev.	Unit		
13. Defensor Protective Equipment, Inc./	This firm markets a 3 lb 11 oz vest made of overlapping Daron fiber glass armor plates covered with a nylon material with reinforced webbing. This vest is designed to protect vital frontal body areas from thrown objects as well as bullets with a velocity up to 855 ft/sec. Other available models will provide protection against handgun bullets up to and including 9mm Para-bellum and the standard .357 Magnum load with a 158 grain lead bullet.	3 lbs 11 oz				1	Available at present time.
14. Dr.R.F. Rolsten (Consultant)	A ballistic nylon vest affords protection against nonballistic threats and handguns up to and including .357 Magnum. It is an all-nylon vest with no metallic protection.	16 lbs				2	Under development and has successfully passed ballistic tests.
15. Aeronutronics Div Philco-Ford Co/	Leg armor for helicopter pilots offers protection against cal. .30 M2 AP projectiles at muzzle velocity and zero degree obliquity. It is formed from composite DPSA steel armor for complete protection.	50 lbs				1	This armor has been produced in small amounts; there are no problems that would prevent an increase in production.
16. Reflective Laminates Div, Fansteel, Inc.	A ceramoplastic ballistic vest offers protection against nonballistic threats and ballistic threats up to and including cal. .30 M2 AP projectiles at muzzle velocity and zero degree obliquity. It is a nylon cloth carrier with rigid ceramic fiber glass inserts for a regular size 67 - 70-1/2 inches tall the following choices are available.	Protected Area				1	
		10.0 lbs - Chest			\$140		
		12.5 lbs - Back			150		
		4.2 lbs - Groin			50		
		5.9 lbs - Crotch			65		
		32.6 lbs - Complete vest			380		
							Vest in production - Delivery time approx. 2 weeks - 30 days.

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TABLE B.3 (Cont'd)

PERSONAL PROTECTION EQUIPMENT

Mfr./Model	Description	Wt	Size	Est. Cost		Status	Comments
				Dev.	Unit		
17. E. Morton Pitt Co/ Bullet-Resistant Shield	A portable, bullet-resistant shield may be used to protect against handguns with a muzzle velocity up to 1430 feet/sec. It is a fiber-glass resin shield. It has a transparent Plexiglass bullet-resistant window. By kneeling behind this shield, it is possible for a police officer to fire a revolver with added safety. A similar shield without the Plexiglas window is available from Federal Laboratories.	21 lbs	38-1/2" x 18"x3/8"		\$165	1	Available.
12. Federal Labs Rowland Prod, Inc. Gentex Corp/ Riot Shield	A riot shield affords protection against non-ballistic projectiles. Federal Laboratories makes a transparent shield of double-thick polycarbonate that has an impact strength of many times that of safety glass. Convex in shape w/rounded corners, this shield is large enough to protect most of the body's vital parts. Worn on the arm, it has an aluminum handle and an adjustable forearm strap that will break if someone twists the shield.	5 lbs	36"x20"			1	Available
19. Defensor Protective Equipment, Inc./ Safety Helmets American Optical Co Safety Products Div/ Safety Helmets Buco Products Div/ Safety Helmets Lake Erie Chem Co/ Safety Helmets	In attempts to control riots, there is a need for a safety helmet which will protect against bricks, bottles, and other thrown objects or by boards, pipe and other objects wielded as clubs. These helmets are designed to protect the head against such objects. Protection is also afforded the ears and the upper part of the neck. Face shields are available to protect the face and chin straps are used to hold the helmet firmly in place. Most models are available with other accessories such as rain capes, head suspension units, flip-up eye shields, visors, helmet covers and carrying cases.					1	Available

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TABLE B.3 (Cont'd)

PERSONAL PROTECTION EQUIPMENT

Mfr/Model	Description	Wt	Size	Est. Cost		Status	Comments
				Dev.	Unit		
19. Cont'd							
Mine Safety App Co/ Safety Helmets							
Gentex Corp/ Safety Helmets							
20. Gas Masks	Gas masks to protect riot control personnel from effects of CS, CN, DM and other gases. Detailed information on several types is given in the supplementary table below						

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TABLE B.3 (Cont'd)
PERSONAL PROTECTION EQUIPMENT - SUPPLEMENTARY TABLE

Manufacturer/Model	CH	CS	DM	Effective Against Acid Gases	NH ₃	CO	Organic Vapors	Unit Price	Comments
Penguin Associates									
WHG(a)	X	X	X					\$36.95	Wide angle lens; 6-strap harness.
THG(a)	X	X	X					36.95	Wide angle lens; gas-tight fit in 4 seconds; 2 ratchet adjustments.
WHG(a)	X	X	X					29.95	Two-lens face piece, 6-strap harness.
WUG-N2W(a)				X	X	X	X	79.95 to 83.95	Three variations available.
Lake Erie Chemical Co.									
Number 66 + 66B	X	X	X					32 (w/o speaking unit) 37 (with speaking unit)	Two shatterproof lenses; water repellant carrying case.
Number 67	X	X	X					38	Speaking diaphragm; single shatterproof lens; water-proof carrying case.

(a) Includes voice transmitter and outlet valve.

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1. DEVICE NUMBER: B.4.1
2. DEVICE TITLE: Explosive Powered Property Repair Kit
3. PROBLEM AREA CODES: II-3.3.b, III-3.3.c
4. DESCRIPTION: There is a need for a grill which, once it is placed in position, is permanently fixed in place by an explosive charge. The basic feature provided by this item is the rapidity with which barriers may be attached to store fronts or other appropriate openings.

The purpose of this item is to protect property from looters. Using cartridge fired fastener and expanded metal, a ready method of rapidly emplacing protective grills over broken store windows and doors is available. Although not preventing initial looting of window displays, grills thus installed might appreciably reduce loss from second-wave looters and "scavengers."

5. ESTIMATED COST:
 - a. Cal. 0.22 Power Tools - \$109-\$148
 - b. Cartridge-fired Pins - \$11/box of 100
 - c. Metal Mesh - \$184 per linear foot of grill 10 feet high
6. STATUS: 1 - Commercially Available

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1. DEVICE NUMBER: B.4.2
2. DEVICE TITLE: Compact Fire Extinguisher
3. PROBLEM AREA CODES: II-3.3.b. III-3.3.c
4. DESCRIPTION: Small hand-thrown fire extinguisher for retarding or extinguishing a fire in its initial stages prior to the arrival of professional firefighters and equipment. Device to be effective over an area equivalent to that produced by a Molotov Cocktail. It could be approximately the size and weight of grenades in general and would be constructed in such a way that it can be carried without interference to an individual's performance of his primary duties and with due attention to safety factors.
5. STATUS: 3 - A search for promising chemical agents for such a device is being conducted under contract for USALWL.

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1. DEVICE NUMBER: C.1.1
2. DEVICE TITLE: Communications, Radio
3. PROBLEM AREA CODES: I-2.a, II-2.a, II-2.b, II-3.1.a, III-2.a, III-2.a, III-3.1.a, III-3.1.b
4. DESCRIPTION: An extremely wide variety of military and commercial equipment is available to cover most radio communications needs. Furthermore, the engineering technology is so highly advanced that a majority of special requirements can be satisfied without extensive research and development. Consequently, no attempt will be made to catalog more than a few typical examples of the hundreds of available devices.

Table C.1.1, following, is a representative listing of radio communications devices which have been suggested for riot control applications. This list indicates the variety of forms in which such equipment can be produced. Items 1 and 2 of the table are examples of miniature transmitters for use in intelligence gathering. They can be carried unobtrusively by undercover agents or can be used for "bugging." Applicable problem area codes are I-2.a, II-2.a, II-2.b, and III-2.b.

Items 3 and 4 of the table are sensitive receivers which provide a means for alerting or paging specific individuals. They may or may not include a capability for receiving voice messages. These would be applicable in problem area I-2.a, II-3.1.a.

Item 5 is a code transmitter for sending simple code messages and for identifying the carrier. It may have application in problem areas I-2.a, II-2.a, II-2.b, and III-3.1.b.

Items 6 through 10 are a few of the many "handy-talkie" type 2-way radio sets for communications among foot forces and between such forces and higher levels of command. Their small size imposes definite limits on transmitting power and, consequently, range of communications. However, these limitations can be overcome by use of the automatic relay devices, items 14 and 15 of the table. The several existing military sets of this type have not been listed. Applicable problem areas are II-3.1.a and III-3.1.a.

Items 11, 12, and 13 are mobile sets for vehicular or fixed station use. The variety of sets available as standard military items or commercial units is very large. Within the size limitations imposed by the vehicular carrier, almost any desired characteristic can be provided in such equipment. Problem areas in which these radios are applicable are II-3.1.a, III-2.a, and III-3.1.a

The remaining items in the table are suggested modifications, adaptations and additions for improving or extending the capabilities of radio communications systems. Their applications are described in the table.

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TABLE C.1.1
RADIO COMMUNICATIONS DEVICES

Mfr./Model	Description	Wt.	Size	Est. Cost		Status	Comments
				Dev	Unit		
1.	Small mouth-held transmitter for surreptitious use by undercover agents.			\$ 40		1	Such devices are advertised by suppliers of equipment for clandestine use.
2.	Wristwatch transmitter: Sensitive microphone and transmitter in wristwatch housing. Broadcasts up to 200 ft. Used with FM receiver.	1/4 lb		\$375 (\$40 for FM Recr.)		1	Available commercially from radio hobby store catalogs.
3. Lafayette Radio and Elect/Pocket Pager	Remote call receiving device as used by doctors, salesmen, etc. 27 Mhz, any of 23 possible channels. 0.7 microvolt sensitivity.	1 lb	5-1/2"x2-3/8"x15/16"	\$ 70		1	
4. Mallicrafters/CRU-100 Series	Same as above, but 27-50MHz, 108-135 MHz, or 144-174MHz.	1 lb	6"x2-3/4"x1-5/8"	\$ 40		1	
5. Litton Ind.	Digital, low-data-rate transmitter of distress and identification codes. Miniature size for use by undercover agents.			\$5,000 \$ 25		2	
6. GE/Pocket Mate	Two-way, hand-held, radio set. Police freq. bands. 1 watt output.	18 oz	8"x2-1/2"x1"			1	
7. Motorola/PREP	Two-way, 2 freq., belt mounted radio set. 450MHz, 7/10 watt output.	35 oz		\$200		1	PREP (Personal Radio Equipped Police) concept includes use of "repeaters" to extend communications range. Has been used in Detroit and New York.

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TABLE C.1.1 (Cont'd)

RADIO COMMUNICATIONS DEVICES

Model	Description	Wt.	Size	Est. Cost Dev Unit	Status	Comments
8. Lafayette Radio/ Syna-Con 5	Sophisticated hand-held Citizens' Band, two-way radio. 6 channels 5 watts.	5 lbs	10-1/2"x3-1/4"x2-1/6"	\$100	1	
9. Motorola/HT Series	Two-way, hand-held, FM radio. 25-52 MHz at 1.4 watts; 132-174MHz at 2.9 watts; and 450-470 MHz at 0.7 watts. 0.5 microvolt receiver sensitivity. Environmentally ruggedized.	2 lbs	8-1/4"x3-1/8"x1-1/2"		1	Now in use by some police forces.
10. RCA/Personal force	Hand-held, 2-way radio. Five channels in either the 30-50 MHz band, or the 132-174MHz band. 2.2 watts output; 0.5 microvolt receiver sensitivity.	30 ozs	8-1/16"x3-3/8"x1-3/4"		1	Plug-in modular construction for ease of maintenance.
11. Motorola/PT Series	Man portable/vehicular, two-way radio operating in 25-54MHz or 132-174MHz. Power output up to 10 watts.	9 lb 10 oz	10"x7-1/2"x3-3/4"		1	Back-up mobile unit for vehicle operation and emergency base station.
12. Motorola/Motrac Series	Vehicular, two-way radio 25-50, 136-174, or 450-470MHz units available. Up to 110 watts output in lower bands, up to 60 watts output in high band. Available for 4 channel operation. 0.5 microvolt receiver sensitivity.				1	Operates from all standard vehicle power systems.

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TABLE C.1.1 (Cont'd)
RADIO COMMUNICATIONS DEVICES

Mfr/Model	Description	Wt.	Size	Est. Cost Dev	Status	Comments
13. RCA/Super-Series	Vehicular 2-way radio. Available for 50, 150 or 450 MHz bands. Up to 100 watts on low bands and up to 60 watts on high band. 0.5 microvolt receiver sensitivity. Can be set up for 4 channel operation.					
14. Hard Wire Relay Terminal	Automatic 2-way radio set to extend range of hand carried, short-range transmitters. Receives signals and automatically retransmits to control center using hard wire (telephone) lines.			\$10,000	2	A number of such units would have to be placed in trouble-areas prior to riots.
15. Radio Relay Transceivers	Similar to above, but retransmits by radio at high power levels.			\$10,000	2	Same as above. Military units of this kind have been developed.
16. High Ambient Noise Level Communications	Mouth-held, low mass plastic tubes to carry speech to a microphone contained in an accompanying plastic helmet. Tubes act to shield microphone from ambient noise.			\$200	1	Concept is that used by plane handlers on Navy aircraft carriers. Navy unit contains radio transmitter in helmet with fraction of a watt output. Both hands are left free.
17. Gas Mask Microphone	Bone conduction microphone compatible with gas mask to permit voice communications by radio and public-address systems.			\$3,000	2	Some work has been done in this area for helicopter applications.

TABLE C.1.1 (Cont'd)

RADIO COMMUNICATIONS DEVICES

Mfr./Model	Description	Wt.	Size	Est. Cost Dev Unit	Status	Comments
18. MEICO, Inc./ Privacom Radio Scrambler	Provides communications security by use of voice frequency inversion. A small transistorized unit that can be attached to any radio system.				1	Works on variable frequency principle with go and return signals using separate inversion frequencies which may be changed easily.
19. ITT Federal Labs/ Secure Communications	Transmitter modulation techniques to scramble communications and prevent monitoring by riotous elements. Can be used with existing FM radio systems.				2	Pseudo-noise (bi-phase and frequency hopping) modulation techniques. A low-cost modification kit has been developed by ITT to convert sets like AN/VRC-9 and 10 to frequency hopping units by incorporating spread spectrum modulation.
20. SCM Kleinschmidt/ Telescripter Teleprinter	Printer to operate with radio or wire communications sets. Prints 75 words per minute and produces original and 3 copies with fan-fold paper. Operates on 12 volts at 25 watts.	12-1/2 lbs	13"x9-3/4"x5-1/2"		1	Provides printed messages for command and control use with higher level of security than voice. Expands capabilities by permitting unattended operation.
21. Ferranti Electronic/ Automatic Printer	Similar to above. Punched paper tape message sent by radio to mobile receiver. Output is strip printer. Noiseless, speed of 300 to 400 wpm. System bandwidth 3 khz, operates on 12 volts, 1-2 amps. Select call capability allows up to 800 individual addresses.		9"x7"x3"		2	Apparently, printing technique allows transmission of alphabetic and pictorial information. Secure system. Permits unattended communications.

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1. DEVICE NUMBER: C.1.2
2. DEVICE TITLE: Communications, Public Address System
3. PROBLEM AREA CODES: I-1.b, I-3.a, II-3.1.a, II-3.2.a, III-2.a, III-3.1.a, III-3.1.b, IV-1.a.
4. DESCRIPTION: Public address systems are useful in riot control for command of security forces and in crowd control. Because of the noisy environments in which they must operate, public address systems for this application should be designed to provide high power and should employ microphones able to discriminate against background noise. There are a number of public address systems available as standard Army items which could be employed in riot control.

Table C.1.2, following, lists several systems which have been suggested. The items are listed in order of increasing size. In addition, those modifications, listed in Table C.1.1 as items 16 and 17 could be useful to improve performance under special conditions.

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TABLE C.1.2

PUBLIC ADDRESS SYSTEMS

Mfr./Model	Description	Wt.	Size	Est. Cost		Status	Comments
				Dev	Unit		
1. Penguin Industries	helmet mounted public address system, 25 watt transistorized unit. Speaker mounted on top of helmet. 360° sound projection. 200 yard range. Microphone, helmet mounted and positioned in front of users mouth, is designed to discriminate against background noise.	8 lbs				1	Allows freedom of both hands while in use. Useful for riot platoon or squad commander.
2. Audio Equip Co/ Hailer or Port-a-Chief	Electronic megaphone. Hand-held with pistol grip.					1	Similar to standard military unit.
3. Federal Sign and Signal/Voice Gun	Hand-held electronic megaphone with pistol grip.	3-1/4 lb	7-1/4" dia x 9-1/2" long			1	
4. Concept	PA system with highly directional loudspeaker. Hand-held or vehicle mounted.				\$100-200	1	Directional characteristics (if attainable) would isolate riot leaders and defeat leaders instructions to mob.
5. Many Mfrs/Mobile	Vehicle mounted system. Amplifier mtd under dashboard. Operates from vehicle power. Power outputs up to 100 watts readily available.					1	Very high power outputs, limited only by primary power source of vehicle, can be developed.

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TABLE C.1.2 (Cont'd)
PUBLIC ADDRESS SYSTEMS

Mfr./Model	Description	Wt.	Size	Est. Cost		Status	Comments
				Dev	Unit		
6. Applied Electro-Mechanics, Inc./AEM-1 Loudhailer	Compact, transistorized, helicopter mounted system. 350 watts output. Operates from 28V DC aircraft electrical system. Can cover 1 sq mile from altitude of 2,000 feet.					1	Can be adapted for ground vehicle use.
7. Concept	Remote operated PA system. Connected by radio link to remote transmitter by use of radio relays.			\$6,000		3	Can be operated from portable radio transmitters. Multiple loudspeakers spread throughout riot area can saturate area with message from single source.

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1. DEVICE NUMBER: C.1.3
2. DEVICE TITLE: Printing Devices
3. PROBLEM AREA CODES: I-1.b, II-3.2.a, III-2.a, IV-1.a
4. DESCRIPTION: A number of portable devices are available for originating and duplicating printed communications. Delivered to the scene of a riot, such items could be used to produce current and useful information as an emergency alternative to newspapers, radio, and TV. Important information (such as curfew restrictions; food dispensary locations; first aid stations; penalties for looting, burning, insurrection; names and locations of persons detained; and facts to dispel rumors) could be rapidly produced for wide display as semi-permanent references.

Examples of potentially useful devices are the following which have been proposed:

a. Portable Printing Press - This is a small lithographic-type, hand-operated roll-press which is being explored at the USALWL for military applications. The press is capable of producing copies from drawn, handwritten, or typed information. Expected production unit cost is \$100 to \$300.

STATUS: 1 - Prototypes are now available.

b. Non-Mechanical Duplicator - The duplicator is a simple, lightweight device containing a master mat (a plastic impregnated with ink). It is prepared for printing by simply drawing or etching on the mat with a stylus (an ordinary pencil serves this purpose). Blank paper is then placed in intimate contact with the mat by use of a hand roller and the image is made. A version of this duplicating device, developed at the USALWL, is capable of making 50,000 copies from the mat before the ink supply is exhausted. Unit cost is estimated at \$100.

STATUS: 2 - Time to attain operational status is approximately three months.

In addition to the above items, there are a number of photoprocessing and electrostatic duplicating devices commercially available. With some exceptions, these tend to be rather complex, heavy, demanding of frequent preventive maintenance, and costly. All of them require large amounts of electrical power.

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1. DEVICE NUMBER: C.1.4.1
2. DEVICE TITLE: Optical-Type Communications Devices
3. PROBLEM AREA CODES: I-1.b, I-2.a, II-2.a, II-3.1.a, II-3.2.a, III-2.a, III-3.1.a, III-3.1.b
4. DESCRIPTION:

a. C.1.4.1.1 - Multicolored Flashlights

Ordinary flashlights incorporating a pinwheel of colors or several different colored bulbs selectable by an external switch may be useful for signalling and identifications. An appropriate color code, changeable on a daily basis would be required. Such a device should not cost more than \$10 per unit.

STATUS: 1

b. C.1.4.1.2 - Infrared Communications Equipment

Infrared equipment provides a secure means of line-of-sight communications. The equipment could be used for simple signalling or could be voice modulated for verbal messages. Both incandescent and laser signal sources are available. Various photodetectors are available for use as receivers. Depending upon the degree of sophistication desired, cost per transceiver can be expected to range from several hundred to several thousand dollars.

STATUS: 2

c. C.1.4.1.3 - Traffic Control Signalling System

Signal paddles and an apron consisting of electroluminescent "tapelights" enable a traffic control officer and his signals to be clearly visible at long distances at night. A paddle consists of a conventional two-cell flashlight case at the end of which is affixed a 2" x 12" rigid electroluminescent tapelight. The apron is designed to contain tapelights in a "T" configuration. The traffic control officer is visible as a result of the apron. Twenty evaluation models could be provided for approximately \$5,000.

STATUS: 2 - Available in about 3 months.

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1. DEVICE NUMBER: C.1.4.2
2. DEVICE TITLE: Ultrasonic Receiver & Transmitter
3. PROBLEM AREA CODES: I-2.a, II-2.b, II-3.1.a, III-2.a, III-3.1.a, III-3.1.b
4. DESCRIPTION: The Ultrasonic Receiver and Transmitter is a signalling system consisting of separate hand-held receivers and transmitters, each of which is 6" x 2-3/8" x 1-5/8" and weighs approximately 1 pound. Information is transmitted as continuous wave signals at frequencies just above the audible range. Transmission is controlled by a pushbutton and is therefore limited to simple coded messages. The receiver converts the ultrasonic signal to an audible one which is heard by use of an earphone.

This system provides a means for silent signalling to distances of about 200 meters. It is directional, but not sharply so. The device is useful for command and control and identification purposes. Estimated cost per set is \$800 in small quantities.
5. STATUS: 1

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1. DEVICE NUMBER: C.1.4.3
2. DEVICE TITLE: Prepared Public Information Tapes
3. PROBLEM AREA CODES: I-1.b, II-3.1.a, II-3.2.a, III-2.a, III-3.1.a, III-3.1.b
4. DESCRIPTION: This is a concept for the preparation of audio and video tapes incorporating public information and instructions for future use during riots, if required. Pre-recorded tapes would be distributed to and stored by local radio and television stations and broadcast on pre-arranged signal. Total costs for putting this idea into operation in an area has been estimated to be \$50,000.
5. STATUS: 1 - Although this exists only as a concept, no materiel development is involved.

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1. DEVICE NUMBER: C.1.4.4
2. DEVICE TITLE: Portable Computer Terminals
3. PROBLEM AREAS: II-3.1.a, III-2.a, III-3.1.a, III-3.1.b
4. DESCRIPTION: Portable computer terminals, which may be located at command posts and control centers, would accept manual and magnetic or punched-card input; data output would be in the form of hard copy (printed sheet or tape). They would be used with a central, time-sharing computer.

It has been estimated that a pilot system consisting of a leased central computer and about six portable terminal units would cost \$300,000 for a six-month demonstration.

5. STATUS: 2 - All components are available; however, systems engineering and extensive software are required. The pilot installation will require several months to reach operational status.

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1. DEVICE NUMBER: C.1.4.5
2. DEVICE TITLE: Emergency Call System for Busses
3. PROBLEM AREAS: II-3.1.a, III 2.a, III-3.1.a, III-3.1.b
4. DESCRIPTION: An acoustic (ultrasonic) or electromagnetic (radio, optical) emitter could be installed on passenger busses to be turned on by the driver when he wanted to summon help. The signal, which could be encoded to identify the bus, would be detected by appropriate sensor devices located in police call boxes, fire alarm boxes, traffic controls, or street lights and would be decoded and recognized by a central signal processor. This, in turn, would automatically alert the bus company and/or police.

This system could be used together with a patrol vehicle locator system that would use the same emitters and sensors. No cost estimate is available.

5. STATUS: 2

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1. DEVICE NUMBER: C.1.4.6
2. DEVICE TITLE: Interface Switchboard
3. PROBLEM AREAS: II-3.1.a, III-2.a, III-3.1.a, III-3.1.b
4. DESCRIPTION: This is a concept for the use of an interface telephone switchboard to prevent jamming of police communications networks during riots. The interface switchboard would handle incoming calls to police headquarters and would route them on to an internal secondary switchboard or perform in parallel with the second switchboard.

Cost for feasibility testing has been estimated to be \$10,000.

5. STATUS: 2 - Required equipment is available, but test of the concept is necessary. It will take approximately two months to attain operational status.

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1. DEVICE NUMBER: C.2.1
2. DEVICE TITLE: Surveillance Equipment
3. DESCRIPTION: Surveillance equipment includes those devices which perform a search function or which enhance existing search capabilities. They serve to extend the performance of human senses (primarily sight) by permitting search of areas obscured by darkness and other obstructions and by providing a means for recording information of the same type for subsequent analysis.

Table C.2.1 lists a few of the available surveillance devices. A wide variety of additional radar and optical systems have been and are being developed by US military agencies. They should be investigated for riot control surveillance.

In addition to standard surveillance systems, several special devices are in various states of research and development. These include an explosives detection technique being researched by IIT Research Institute for the Federal Aviation Agency. It is based upon the use of "control potential olfactometry" to measure very low level concentrations of glycol dinitrate, the most volatile constituent of nitroglycerine. Other methods for explosives detection are being explored at the U. S. Army Limited War Laboratory. These include systems based upon the use of mass spectrometry, optical absorption spectrometry and various chemical analyses. These items have not been listed in the Table.

Various types of illumination techniques to improve optical surveillance are listed in Table C.2.1 as items 10 through 12. These are merely representative of the many illuminators available from both commercial and military sources. An interesting variation of item 11, IR illuminators, is the conversion of vehicle headlights to infrared. This has been done in military combat vehicles. It permits night driving with reduced detectability; however, it requires the use of image converter "goggles" by the vehicle operator.

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TABLE C.2.1 (Cont'd)

SURVEILLANCE DEVICES

Mfr./Model	Description	Wt.	Size	Dev.	Est. Cost Unit	Status	Comments
8. Various Mfrs./Eugitive Vehicle Identifier	This is a concept for the use of a small IR radiometer to measure the heat radiated by parked cars. Radiation level will indicate engine and exhaust temperature which is correlated with intensity of activity and length of time since activity.				\$1,000	1	A number of available hand-held radiometers could be applied to this use.
9. Various Mfrs./Trans- mitter Locator	Radio receiver device to detect and locate any RF transmitter room "bug" or wireless phone tap. Operates over a wide frequency range, typically 5 to 75 megahertz.	3 lbs		\$ 450		1	
10. Spectrolab/Nightsun SX-16 Searchlight	Powerful, lightweight searchlight, developed for helicopter use but adaptable to ground vehicles. Develops approx. 3.8 million candlepower. Projects 300 ft diameter spot from altitudes of 2,000 ft. Input power is 28V DC at 60 amps.	25 lbs		\$ 500		1	
11. Various Mfrs./IR Illuminators	Infrared searchlights ranging from standard incandescent light bulbs to multimillion candlepower xenon arc lamps employing infrared filters are available for both ground and airborne use. Most such devices perform most efficiently in the near IR region.						These can be used to supplement IR surveillance devices listed above and various types of image converter night sights such as the family of image intensifiers developed by the Army.

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TABLE C.2.1
SURVEILLANCE DEVICES

Mfr./Model	Description	Wt.	Size	Est. Cost Dev. Unit	Status	Comments
1. LML Development/ Medium Range Directional Radar	A CW, UHF, doppler radar to provide a means for detecting snipers in buildings. System has a 40° to 60° beamwidth. It will determine azimuth and elevation of a moving man through 12 inches of concrete from a distance of 300 feet.	5 lb		\$3,000	2	This radar can also be used in intrusion detection (See C.2.2 following)
2. LML Development/ Long Range Directional Radar	A pulse doppler radar to measure azimuth and range of men and vehicles to within 5° and up to 1500 feet. Can also detect targets through building walls with reduced range.	15-20 lbs	Suitcase size	\$20,000	2	A 50° beamwidth prototype has been demonstrated. Narrow beam system will require 3 to 5 months development time.
3. Various Mfrs/Closed Circuit TV	A high resolution, closed circuit, television system consisting of a camera unit and a remote control unit capable of operating as far as 1,000 feet apart. control	5 lb (typical camera) 50 lb (typical control unit)	13" long x 2-3/4" dia (typical camera) 14" x 6" x 4" (typical control unit)	\$3,000 up	1	Can be operated as ground or airborne (w/telescopic optics) unit.
4. Various Mfrs/Low Light Level TV	Similar to above but employing image intensification techniques for night surveillance.				1	Ground or airborne operation. Can be supplemented with infrared illumination (see below).

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TABLE C.2.1 (Cont'd)

SURVEILLANCE DEVICES

Mfr./Model	Description	Wt.	Size	Est. Cost		Status	Comments
				Dev.	Unit		
5. Kollsman Inst/Night Window	Low light level TV type system which presents a real-world image superimposed on vehicle (automotive or aircraft) window. Images are projected on a transparent plane mounted inside vehicle windshield and appear in same scale as real scene.				\$20,000 - 50,000	2	System has been developed and is under evaluation.
6. Sandia Labs. Camouflage Detection Camera	Still under research, this technique provides a purely electronic means for converting white light into colored light. It is based upon the use of a thin slice of ferroelectric ceramic sandwiched between two polarizing filters; application of a voltage to the ceramic controls color transmission. In practice, locations photographed in white light are converted to color to detect the presence of camouflaged positions. This method may also enhance contrast in low light level situations.			\$300,000 to 500,000	\$2,000	3	Feasibility of this experimental technique has yet to be demonstrated.
7. Concept/Fiber Optics Periscope	Use of fiber optics could provide the basis for a flexible telescope. With a maximum angle approaching 180°, one could examine opposite side of a wall or bulwark without undue exposure.			\$30,000	\$150-200	2	Light transmission efficiency may not be adequate without supplementary optics.

TABLE C.2.1 (Cont'd)
SURVEILLANCE DEVICES

Mfr./Model	Description	Wt.	Size	Est. Cost		Status	Comments
				Dev.	Unit		
12. Concept/Area Illumination	This is a concept for the use of aerosol clouds over a large area. When the cloud is illuminated by ground searchlights, it would, by diffusion, provide illumination over large portions of a city.						Some development work in this area has been initiated.

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1. DEVICE NUMBER: C.2.2
2. DEVICE TITLE: Detection of Intruders
3. PROBLEM AREA CODES: III-3.1.b
4. DESCRIPTION: Intrusion detection devices are a class of surveillance and detection equipment distinguished by the fact that they are not employed in search operations. Typically, intrusion detectors are statically emplaced to form a sensory barrier to the entrance of people or vehicles into restricted areas.

Intrusion detection has been the subject of considerable research and development in the last few years. A wide range of techniques have been explored. Those which appear applicable include acoustic, ultrasonic, microwave, and optical sensory techniques. Table C.2.2 lists those of the many intrusion detection devices which have been proposed for riot control applications.

A useful supplementary device for use with remote intrusion detectors is a miniature radio transmitter which can be incorporated into the detector package. This will eliminate a number of difficulties associated with the use of wire lines. However, in order to permit detector identification in a multisensor installation, coded radio signals must be used. A transmitter of this type should add little to the detector system cost.

Another potentially useful proposal for the employment of intrusion sensors is a concept for an "Automatic Alarm System" whereby the detector is connected to a telephone through an automatic dialing device. Sensing of an intruder would activate the telephone, cause a pre-programmed number to be dialed, and transmit an appropriate message. Such a system is under consideration. It has been estimated that an operational system can be developed in about 6 months at a cost of \$60,000.

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TABLE C.2.2
INTRUSION DETECTION DEVICES

Mfr./Model	Description	Wt	Size	Dev.	Est. Cost Unit	Status	Comments
1. Honeywell/Types W676C, and W768A.	Acoustic intrusion detection system. The sensor may be located as far as several hundred meters from the monitoring panel by wire (actual distance depends upon sensor impedance). System can be operated from AC power lines or batteries.		10-3/4"x8-1/4"x2-7/8"		\$204 360	1	Can be used for seismic sensors. Detection range of acoustic sensors is short.
2. Tracer Systems/Model T-70, R-70	Remote acoustic intrusion detector. Sensitive microphone is coupled to radio transmitter, T-70, which sends signal to receiver at distances up to 1.5 miles. Device is claimed to be sensitive enough to pick up whispers at 25 feet. Operates from 117V ac or 12V dc.				\$595	1	Transmitter T-70 (\$255) and receiver R-70 (\$360) may be purchased separately.
3. Advanced Devices Lab/ Microwave Intrusion Detector	Detector system is a doppler trans- mitter-receiver unit and a remotely located control unit. Any motion occurring within the antenna radiation field gives a visual and audible alarm and provides a signal to actuate remote alarms. It has a detection range of 250 feet. System operates from 117V ac lines or batteries.		7"x9"x10" (trans-rec unit) 3"x7"x9" (control unit)			1	

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TABLE C.2.2 (Cont'd)
INTRUSION DETECTION DEVICES

Mfr./Model	Description	Wt	Size	Est. Cost		Status	Comments
				Dev.	Unit		
4. LNL Development/ CW/UHF Doppler Radar	Miniature UHF doppler radar, approx. the size of a cigar box. Can be used with either an omnidirectional or directional antenna to vary coverage. Detection ranges up to about 300 feet (depending upon antenna type) are attainable. Radio relay for remote monitoring of alarms can be included.		Approximately 3"x7"x10"	\$2,000	\$ 500	2	
5. Barnes Engr Co/IR Intrusion Detector	Passive infrared detection system. Narrow field of view forms line barrier. System measures change in temperature at ranges up to 750 feet. System consists of detector unit and remote alarm unit. Wire or radio link between units is available. System operates from batteries.	7 lbs	5"x4"x2-1/2" (Sensor unit) 5"x4"x2-1/2" (Remote Alarm)		\$4000 - \$5000	1	Various forms of this device have been developed varying from miniature hand-held units to large, heavy long-range radio-meters.
6. RSD - Intrusion Detection using Image Storage Tubes	A system now under study by Philco-Ford uses image storage tubes. TV type display would indicate only changes in field of view of camera, thereby indicating presence of moving targets.			\$100,000- 200,000		3	All components have been developed. System problems resulting from ambient light effects and other noise factors must be overcome.

1. DEVICE NUMBER: C.2.2.7
2. DEVICE TITLE: Patrol-Car Locator Techniques
3. PROBLEM AREA CODES: II-3.1.a, III-3.1.a, III-3.1.b
4. DESCRIPTION: Several techniques have been suggested for patrol car location in order to reduce response time, permit dynamic deployment of forces, and provide for better administrative control. These include:
(a) Patrol-car emitters and call-box sensors - Each car would carry a visual, acoustic, or electromagnetic emitter that could be detected by sensing devices located in call boxes, fire alarms, traffic controls, or street lighting locations. The emitter signal would be coded to identify the patrol car. The presence of the patrol cars would be detected by the sensors and the location would be telemetered automatically over the existing call-box telephone lines to a computer-controlled display board in the dispatching center; (b) Modified radar transponder system - A radar beacon system is being developed by the Hazeltine Corporation to provide graphic indication of police-car locations in the field, so that rapid and precise response is possible in emergencies. The system used for ground vehicle tracking is similar to that used in present aircraft radar beacon systems; i.e., the ATCRBS System. The equipment involves a transponder on the tracked object (AN/APX-77), an interrogator at headquarters or central location, and an interrogator antenna (AS-1812). Requirements for a car locator system are that it can tolerate multiple reflections (off buildings) in its transmission path, have a maximum range of at least 10 miles, maximum error of about 100 yards, and information update capability of 30 seconds; (c) Medium frequency radio direction finding system - This system would use a car-borne medium frequency transmitter turned on for short periods by radio command from the dispatching center. Conventional automatic radio direction finders of the type used by ships and aircraft could then triangulate on the car to fix its position; (d) Car-borne position computation and reporting system - Such a system would use a dead-reckoning analyzer which would continually compute the location of the car and report its position to the dispatching center. The analyzer would require distance-travelled information from the odometer and direction-of-travel information from a compass. An alternative would be to divide the patrol beat into grids, and have the car continually update its position by the officer punching in his grid number whenever he passed into another grid section. A version of this system is now in use in Rome, Italy. The development of inexpensive compasses would improve the acceptability of this system.

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1. DEVICE NUMBER: C.3
2. DEVICE TITLE: Rapid Magnification Device for Maps
3. PROBLEM AREA CODES: II-3.1.a, III-3.1.a
4. DESCRIPTION: This is a concept for the development of a device for rapid photographic "blow-up" of detailed municipal maps, varying in scale from 1:50,000 to 1:1,000, followed by inexpensive multiple copy reproduction of the magnified area for field use. It has been estimated development will cost \$30,000.
5. STATUS: 2

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1. DEVICE NUMBER: C.4
2. DEVICE TITLE: Marking and Tagging Techniques
3. PROBLEM AREA CODES: I-2.a, II-2.a, III-3.3.b, III-2.b, III-3.1.b
4. DESCRIPTION: Various techniques for marking security force personnel, rioters, areas, vehicles and private property are listed in Table C.4. These are used for identifying individuals, establishing ownership of property, and locating areas of tactical interest such as landing zones.

Paints, visible dyes, and normally invisible UV fluorescent compounds are available for visual identification. Odoriferous chemicals include both odor producing compounds and chemicals which are normally odorless but which become odorous when properly activated.

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TABLE C.4
MARKING AND TAGGING TECHNIQUES

Mfr./Model	Description	Wt.	Size	Est. Cost		Status	Comments
				Dev.	Unit		
1. Individual Markers	Rifles and pistols firing gelatin capsules containing paint are presently available. These permit marking of people or vehicles to distances of 80 feet with persistent dyes.				\$100	1	Short term development.
2. Concept/40MM Identification Marker Munitions	A proposal for development of a 40MM marker projectile which can be fired from the M-79 grenade launcher. The projectile will incorporate a standard M-118 or XM-195 cartridge case with a reduced propelling charge; a pyrotechnic fuze, projectile body, frangible payload canister containing bright paint or other dye markers, an expulsion charge and a small burster charge. Burster will be set to burst the payload approximately 15 feet above heads of the rioters. Should provide a range of 50 to 100 meters.				\$ 25	2	
3. LWL Development/Personnel Marker Grenade	A hand thrown, non-lethal, non-toxic, non-irritating explosive device which when activated would cover a small group of people with uniquely colored and/or odoriferous chemicals.	1 or 2 lbs	Hand-held grenade		\$ 8	2	All materials and technology are fully developed. Preliminary testing of similar items have demonstrated feasibility.
4. Concept/Marking Powders	Fluorescent powder sprayed into crowds from pressurized containers such as the dry fire extinguishers. Small particle size will adhere to most clothing and skin. Will not be readily visible until viewed under ultraviolet light.			\$2,500		2	Materials and technology are fully developed. Demonstration model could be available in a few weeks. Hazardous features vary with the agents selected for dissemination.

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TABLE C.4 (Cont'd)

MARKING AND TAGGING TECHNIQUES

Mfr./Model	Description	Wt.	Size	Est. Cost per Unit	Storage	Comments
5. Concept/Innocuous Tags	Invisible "dye" added to CS or similar type sprays or streams used in mob control. Would fluoresce under UV radiation.			\$5,000	2	
6. /Rapid Identifi- cation of Non- Uniformed Personnel	Visible clothing identification codes to identify non-uniformed security force per- sonnel. Code could include color and style of various articles of clothing. Code could be changed daily.				1	This method has recently been adopted by Wash, DC Police Department
7. Polaroid/Identifi- cation Card System	System consisting of Polaroid #926 Card Camera, #930 Card Laminator, #932 Die Cutter, #936 Developer Timer and #938 Pouch Sealer. Camera simultaneously photographs person and data card. Finished I.D. card can be completed in 2 minutes. It is tamper-proof because plastic lamination destroys card if it is removed.			\$2,500	1	This item can be used for security force identity and to document arrest information.
8. LWL Development/ Emergency Landing Light System	Electroluminescent landing light system employing "Tapelights." Provides green, red, and yellow lights. Operates on commercial power lines or batteries.			\$200 (1 kit)	1	
9. Concept/Undercover Agent Identification	Mouth-held radio transmitter activated by biting action.			\$500 (Xmtr. and Recvr.)	2	

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TABLE C.4 (Cont'd)
MARKING AND TAGGING TECHNIQUES

Mfr./Model	Description	Wt.	Size	Est. Cost Dev.	Unit	Status	Comments
10. LWL Development/ Tracking Transmitter	Miniature transmitter hidden on undercover agent, in mob leaders auto, etc., to permit tracking of movements by a direction finding receiver.	1 lb			\$200	1	
11. Concept/License Plate Identification	Idea for marking vehicle licenses plates so they can be identified. Similar to system used to scan RR cars. Scanning device would permit long-range identification.					3	Developed to the ultimate, such a system could indicate state of origin, license number, etc. Would require enabling legislation and interstate agreements.
12. LWL Development/ Identification System	Miniature electrical device which when irradiated by a radio transmitter will transmit a signal harmonically related to the transmitter frequency. Based upon non-linear electrical properties of semiconductor junctions. Detection range up to 100 meters. Requires no internal batteries.					3	This is a passive device which should be extremely rugged and long-lived.

1. DEVICE NUMBER: C.5
2. DEVICE TITLE: Information-Recording Equipment
3. PROBLEM AREA CODES: I-2.a, II-2.a, III-2.b
4. DESCRIPTION: Various methods of recording information for documentation of events, identification, and for use as evidence in legal prosecution are listed in Table C.5.

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TABLE C.5
INFORMATION RECORDING EQUIPMENT

Mfr./Model	Description	Wt.	Size	Est. Cost Dev.	Unit	Status	Comments
1. Various Mfrs./ Infrared Movie Camera	Hand-held movie camera with infrared film and infrared lights to provide documentation of criminal activities.					1	
2. Transmires Corp (Zeiss Aerotopograah)/ SMK 120 & SMK 40 Stereo-metric Cameras	Tripod mounted Stereo Cameras provide highly detailed photographs of evidence on 3-1/2" x 4-1/2" negatives, have electromagnetic shutter tripping and include built in leveling devices, use wide angle lenses with shutter speeds up to 1/400 second. Focusing Range: SMK 120 - 16 ft to infinity SMK 40 - 8 ft to 33 ft	88 lbs		\$6,000		1	
3. /Miniature Concealed Camera	Wrist or concealed camera to gather evidence and provide documentation.					1	
4. /Alarm Box Camera	A camera to be installed semi-permanently in fire and police alarm boxes. Would require wide-angle lens to assure picture of in- dividual pulling the alarm. Automatic film advance required.					2	Only industrial design required.
5. Sony Corp/Video Rover	A lightweight, self-contained video recording system consisting of a hand-held TV camera and a shoulder hung recorder. Includes zoom lens.	16 lbs				1	
6. GE/Porta Pack TV Recorder	Similar to 5. above.	15 lbs		\$1,295		1	

TABLE C.5 (Cont'd)

INFORMATION RECORDING EQUIPMENT

Mfr./Model	Description	Wt.	Size	Est. Cost Dev. Unit	Status
7. Various Mfrs./Audio Tape Recorder	Portable audio tape recorder to document events and arrests. Method of identifying tape segments for correlation with other information (photographs, etc.) necessary.			\$75-150	1
8. Stancil-Hoffman Corp/ Communications Logger	Multichannel audio tape recorder. Designed to handle 24 hours of messages on 1/4 inch tape. Records 2-way radio telephone and bugging device messages.	32 lbs	19"x11-1/2"x 8-3/4"	\$775	1
9. Concept/Streamlined Arrest Form	A concept for an improved arrest form making maximum use of preprinted information and coding schemes. Format should be such as to readily photograph with arrestee. Should provide cross reference with other recordings (above).	N/A	N/A		2 Requires operational analysis.

FOR OFFICIAL USE ONLY

1. DEVICE NUMBER: C.6.1
2. DEVICE TITLE: Automotive Ground Vehicles
3. PROBLEM AREA CODES: I-3.a, II-3.2.a, II-3.3.a, III-3.1.b, III-3.2.a, III-3.3.b, III-4.2, III-4.b, IV-4.a
4. DESCRIPTION: Table C.6.1 lists a variety of special-purpose vehicles which have been suggested for riot control applications. These are exclusive of existing military vehicles.

In addition, a number of vehicle supplementary items are listed in items 8 through 13.

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TABLE C.6.1

AUTOMOTIVE GROUND VEHICLES

Mfr./Model	Description	Est. Cost		Unit	Status	Comments
		Dev.				
1. Lyncoach & Truck Co/ Riot Control Wagon	An all aluminum van body which will fit on any parcel delivery truck chassis. Not armor plated. Safety glass windows backed with expanded metal screens. Two separate compartments; one for prisoners and one for security personnel. Two gun ports face forward and two to each side.				1	
2. Aerojet General Corp/ Peacekeeper	Armored vehicle about the size of a station wagon. Lightweight armor and bulletproof glass. Has two sets of dual front tires with armored disc between. Turret atop car contains rifle and gas guns, radar, bullhorn, searchlight and LLI TV camera. Pneumatically operated braces can be extended from sides to prevent rioters from overturning vehicle. Special insulation built-in to protect from Molotov cocktails.	\$1 million			3	Presently in design state.
3. Bauer Ordnance Co/ Riot	This armored vehicle uses a Chevrolet truck chassis, 220 hp V-8 engine, 4-speed transmission and power steering. Weighs approximately 4,000 lbs. A 360° turret can mount various weapons. The body is protected by high voltage electricity. A water tank holds 250 gal. and provides for injection of chemical agents. A special flame thrower ejects balls of atomized gasoline that envelop the target and quickly pass on doing little more harm than singeing eyebrows. Rear compartment holds 10 officers or prisoners, or 2 stretchers with attendants.				1	

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TABLE C.6.1 (Cont'd)

AUTOMOTIVE GROUND VEHICLES

Mfr./Model	Description	Est. Cost		Status	Comments
		Dev.	Unit		
4. B&H Enterprises/ R-2 Multipurpose Police Vehicle	A rubber tracked, armored vehicle which can attain speeds up to 35 MPH. It is fully armored, with bulletproof glass, gun turrets and gas ports. Two chemical nozzles mounted forward on the cab can dispense tear gas or fire fighting agents. Three 8 ft. bench seats accommodate a 15 man crew. Cabin is insulated and air conditioned. Chemical toilet is included. Four high power quartz lamps, a PA system, radio and firefighting equipment are operated from central control panel in cab. It weighs 10 tons and includes a 30,000 lb winch, bullet resistant track skirt, two 500 lb tanks of ABC dry chemical fire extinguisher. Unit can operate in 3 feet of water or cross 5 ft. ditch.		\$28,700	1	
5. AAI Corp/	Armored vehicle which is amphibious, uses 6 wheel drive with pneumatic outer wheels and bulletproof inner wheels. It can attain speeds of 75 MPH. It is 7 ft high, 8 ft wide and 14 ft long. Basic equipment includes: 100 gal fire foam tank, 100 gal CN tank, armored cupola w/MPG-100 long range (600 ft) CN grenade launcher, fire foam nozzle (200 ft range) and bulk CN nozzle (100 ft range), and 30 or 60 cal. machine gun, if desired. Two trailers are available: an armored personnel trailer for 8 man force, and a fire foam trailer w/600 gal capacity for making 4800 gals of foam.		\$25,000 - 28,000	1	
6. J. Tom Moore & Sons/ Armored Vehicle	Heavily armored vehicle 22 ft long, 10 ft high, and 8 ft wide. It has 10 forward speeds and 2 reverse speeds. Has capacity of 8 men. Armored plates and louvers can be dropped to protect windows and radiator. Entire lower edge of body consists of sharp barbs to discourage overturning of vehicle. 30,000 lb vehicle can easily go through brick walls.		\$35,000	1	

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TABLE C.6.1 (Cont'd)
AUTOMOTIVE GROUND VEHICLES

Mfr./Model	Description	Est. Cost		Status	Comments
		Dev.	Unit		
7. Chrysler Corp/ Police Patrol Vehicle	Armored 4 man vehicle can attain 65 MPH. It has 4 firing ports, and rotating turret.			1	In production.
SUPPLEMENTARY DEVICES:					
8. Unknown/Emergency Vehicle Traction	This item consists of solid rubber interior treads which bear on surface if tires are slashed.		\$100 (per wheel)	1	Used on Presidential limousine.
9. Concept/Emergency Vehicle Traction	Radial tire construction w/latex filled interior. Heat dissipation by means of multiple fine wire dispersed in latex and terminating in cooling fins or metal rim. An alternate cooling concept could be by air channels.	\$100,000	\$80-100 (per unit)	3	
10. Dow Corning/Flat- proof Tire	Dow Corning has the basic patent on foamed inflation of tires.			2	Dow Corning has a basic agreement with Firestone and Goodyear Rubber Companies for development of these tires.
11. Concept/Internal Jacks	Built-in jacks to raise vehicle completely off wheels would make rocking and turnover more difficult.		\$400	2	
12. Concept/Vehicular Electrical Shield	High voltage, low current source to shock anyone touching a vehicle from outside with complete safety inside. Non-lethal. Controlled from inside vehicle.	\$ 30,000		3	
13. Concept/Debris Clearing Device	Commercial road sweeping brush fitted to military vehicle to clear path of glass and debris for mobility.		\$850	1	

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1. DEVICE NUMBER: C.6.2.1
2. DEVICE TITLE: Body Skids
3. PROBLEM AREA CODES: I-3.a, III-3.2.a
4. DESCRIPTION: A skid or drag would allow a single officer to move a body. Such a drag might consist of a heavy-gauge flexible sheet, roughened on one side to adhere to the clothes, with straps to hold the body down. The other side could be fixed with rollers, or runners so that a single officer could drag a body along a smooth surface. Alternatively, slings may be used to be put around the arms just above the elbows and around the feet at the ankles and allow two men to move a limp body. Unit cost is estimated as \$100 for skids and \$15 for slings.
5. STATUS: 1

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1. DEVICE NUMBER: C.6.2.2
2. DEVICE TITLE: Ground-Effect Machines (GEM)
3. PROBLEM AREA CODES: II-3.2.a, III-3.1.a, III-3.2.a, III-4.a
4. DESCRIPTION: These machines are vehicles free of surface limitations which use a cushion of air for support and can operate in overload operations over a wide variety of terrain. They provide increased speed and mobility for a variety of riot control missions (e.g., sniper-detection, barrier-scaling, airborne command post, roof-top patrols, etc.) without incurring the high costs associated with aircraft and helicopters. The annular jet vehicle seems to have widest support and is furthest advanced in development. State-of-the-art operational equipment falls in the following categories:

Gross weights	-	10 - 400 tons
Effective diameters	-	20 - 200 feet
Operating heights	-	2 - 12 feet
Forward speeds	-	50 - 100 mph
Installed power	-	800 - 80,000 hp

Piston and turbine aircraft engines are suitable for GEM use. For overload operations, normal operating height ranges from 2 to 12 feet. A need exists for development of small (1-4 ton) GEM's with high clearance (72 feet) capability. Discharge of pressurized air may also be used to deliver tear gas. Estimated unit cost is \$50,000.

5. STATUS: 3 - Present development level of GEM considered to be more than half-way toward an efficient, fully-operational system. Small GEM's not yet developed to a great extent. Control system design, dynamic stability, maneuverability, and power plant need particular attention.

Criteria for use of GEM's in riot control must be established.

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1. DEVICE NUMBER: C.6.2.3
2. DEVICE TITLE: Flying Belt
3. PROBLEM AREA CODES: III-4.a
4. DESCRIPTION: A turbojet-powered flying belt, being developed by Bell Aerosystems for the Army Aviation Materiel Command and DOD-ARPA, was flight-tested in late 1968. Power is supplied by Williams WR-19 bypass engine, which has one of the highest thrust-to-weight ratios among domestic engines. The belt includes a ground stand which can be retracted before flight.

Endurance of the device is several minutes and maximum range is several miles. Clear plastic fuel tanks are located on either side of the engine so that operator can check fuel supply. Engine is mounted with air-intake down. Control is provided by two handlebar grips.

Development cost to date has been \$3 million. Unit cost is estimated at about \$3,000.

5. STATUS: 3 - Extended testing continuing.

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1. DEVICE NUMBER: C.7.1
2. DEVICE TITLE: Riot Injury Treatment Kits
3. PROBLEM AREA CODES: III-4.b, IV-4.b
4. DESCRIPTION: These kits would include standard emergency items plus riot control agent antidotes. Design might be part of larger anti-riot kit stowed in box which forms riot shields. Should be sufficiently small to be placed in trunks of police cars so as to be readily available. Estimated development cost is \$10,000. Unit cost is \$30-100 per kit.

5. STATUS: 2

Only industrial design required.

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1. DEVICE NUMBER: C.7.2
2. DEVICE TITLE: Mobile Medical Modules
3. PROBLEM AREA CODES: III-4.b, IV-4.b
4. DESCRIPTION: These structures are modular, compact, lightweight shelter units and power packages which can be erected into virtually any size complex. Self-contained, transportable medical units with short setup time, high reliability and efficiency, controlled environment, and the capability of maintaining all-weather operation have been developed by AiResearch Division of the Garrett Corporation, Phoenix, Arizona.

Largest unit is 144 x 84 x 96 inches, weighs 4,000 to 7,000 pounds. All elements are self-contained, skid-mounted, and can be transported on 2-1/2 ton trucks. Modules include:

- Utility element - 10 KW electric power
- Expandable element - laboratory, supply, surgery
- Inflatable element - ward area, emergency room, other space requirements.

Unit cost is estimated to be \$10,000 to \$15,000.

5. STATUS: 1

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1. DEVICE NUMBER: C.7.3
2. DEVICE TITLE: Riot Control Agent Decontamination Kits
3. PROBLEM AREA CODES: III-4.b, IV-4.b
4. DESCRIPTION: Premixed and prepackaged chemicals to rapidly dissolve and decontaminate agent CS on skin or clothing. Various aqueous solutions containing organic and inorganic bases and a surfactant have been shown to be effective. In particular, solutions of 5-10% monoethanolamine and 0.2-0.3% nonionic detergent will dissolve agents CS and CSZ in cloth in 2 to 5 minutes. Volume ratio of decontaminant-to-agent is about 10:1. Antidote pills are a possible extension of the concept. Unit cost (package) is estimated to be \$10.00.
5. STATUS: 2

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1. DEVICE NUMBER: C.8
2. DEVICE TITLE: Restraint & Detention Devices
3. PROBLEM AREA CODES: I-3.a, II-3.2,a, III-3.2.a
4. DESCRIPTION: See Table C.8.

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TABLE C-8

RESTRAINT AND DETENTION DEVICES

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Mfr./Model	Description	Wt	Size	Est Cost		Status	Comments
				Dev	Unit		
1. Concept/Prisoner Restraint	A kit to adapt vehicles for prisoner detention. Includes sprinkler system and stiff metal screening to prevent damage by kicking.			\$ 2,500	\$150	1	
2. /Portable Prisoner Stockade	Stockade consists of portable stanchions and high-voltage, low-power electrical wire. Walls would be about 6-7 feet high.				\$2.50 per linear foot		
3. Concept/Mechanical "Come-Alongs"	An iron claw with a handle. Unit would be applied to arm of prisoner. It would allow one security officer to control a captive with one hand, leaving the other hand free for weapon use.						
4. Concept/Vehicle	Devices built onto vehicles to retain a large number of people. For example, rigid handles welded to frame over car doors to permit handcuffing of up to 8 prisoners. Alternately: portholes on side of car into which prisoner's hand is inserted and clamped on inside of vehicle.				\$400 per car	2	
5. Kent Corp./"Flex Cuff" Nylon Hand-cuff	A nylon restraining tie used to bind ankles or wrists. Item is 22" long nylon plastic strap with a slotted head at one end and tapered tail at the other. After looping strap around prisoner, tapered end is inserted in slot and pulled tight. A steel barb in head locks strap so that it can be removed only by cutting.	1/4 oz	22" long		\$0.30 (in quantity)	1	Strap includes matte finish for marking.

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1. DEVICE NUMBER: C.9
2. DEVICE TITLE: Planning and Training Aids
3. PROBLEM AREA CODES: I-1.a
4. DESCRIPTION: See Table C.9.

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TABLE C.9

PLANNING AND TRAINING AIDS

Mfr/Model	Description	Wt	Size	Est Cost		Status	Comments
				Dev	Unit		
1. Suggestion/Handbook on Local Resources	A handbook describing techniques for adapting locally available equipment to riot control needs.			\$30,000	\$2-5	3	
2. Concept/Animated Mannequins	Mechanical training device equipped with appropriate sensors to respond to blows of baton could provide direct feedback on effectiveness of blows and realistic practice in use of baton or night stick.			\$50,000	\$3,000	3	
3. Concept/Training Simulator	Training booth in which sights and sounds of riot would be realistically simulated to observe and condition responses of trainee.			\$100,000	\$10,000	3	
4. Various Mfr/Training Tower	A tall (90') tower to train security forces in up and down angle firing for counter-sniper operations.				\$1,500	1	This is to be used at FBI Academy.

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1. DEVICE NUMBER: C.10.1
2. DEVICE TITLE: Heliborne Headquarters
3. PROBLEM AREA CODES: II-3.1.a, III-3.1.a
4. DESCRIPTION: A heliborne command and control center would provide the anti-riot commander communications with elements of his command, displays of the overall situation, and the opportunity to observe directly sectors requiring such attention. Estimated development cost is \$200,000.
5. STATUS: 3.

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1. DEVICE NUMBER: C.10.2
2. DEVICE TITLE: Refugee Kit
3. PROBLEM AREA CODES: IV-4.b
4. DESCRIPTION: To provide a disaster relief kit, mainly food, somewhat on the lines of the LWL Refugee Kit. The present kit was designed for SEA so it would not, in its present form, lend itself to American tastes. A kit based on similar concepts could be provided. Various organizations already have disaster kits and a suitable kit might be available. Estimated costs for development is \$1,000.
5. STATUS: 2

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1. DEVICE NUMBER: C.10.3
2. DEVICE TITLE: Kits for Rappelling Police from Helicopters to Rooftops
3. PROBLEM AREA CODES: III-4.a
4. DESCRIPTION: A rappelling system will permit police to be quickly deployed to rooftops from hovering helicopters. A system is available - developed for use by the US Army for troop deployment into jungles - which is safe and requires a minimum of training. The system consists of a lowering device with rope, a simple body harness, and a webbing anchor attachment to the helicopter. The helicopter webbing anchor attachment could be adapted for the type of helicopter used. Estimated cost is \$4,000 for 50 systems.
5. STATUS: 1

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1. DEVICE NUMBER: C.10.4
2. DEVICE TITLE: Scaling Cable
3. PROBLEM AREA CODES: 111-4.a
4. DESCRIPTION: Scaling cable with press fittings at ladder-rung distances that can be used with hand and foot fittings for climbing from an unanticipated direction. A special grapnel with a short length of chain provides positive anchoring on cornices.
5. STATUS: 3 (Exists in concept stage at the USALWL).

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1. DEVICE NUMBER: C.10.5
2. DEVICE TITLE: Transparent-When-Wet Paints
3. PROBLEM AREA CODES: III-3.3.a
4. DESCRIPTION: PPG Industries has patented a paint which becomes transparent when wet and is opaque to light in dry form. The concept may be useful as a camouflaging or disorienting one in riot situations. Patrol cars and riot-control equipment may be painted with it. No cost information is available.
5. STATUS: 2

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APPENDIX AEXPEDITED NONSTANDARD URGENT REQUIREMENTS FOR EQUIPMENT (ENSURE)

1. Reference is made to:

- a. AR 71-1, Army Combat Developments, dtd 16 Sep 68.
- b. Message, DA 969156, DTG 141621Z Jun 68, Subject: Expediting Requirements for Counter Civil Disturbance Equipment.

2. DA has established a procedure (ENSURE) whereby Army component commanders and chiefs of Army sections of MAAG's and missions, when specifically designated by DA (ACSFOR), are authorized to forward direct to DA, ATTN: ACSFOR, qualitative and quantitative requirements for new or non-standard materiel which is urgently required to support active combat or stability operations (reference 1a). DA has authorized USACONARC to use the ENSURE procedure for equipment and materiel required for riot control and for countering civil disturbances (reference 1b). DCS Military Operations and Reserve Forces - Plans Division - Domestic Affairs Branch (ATOPS-PL-DOM) has the USCONARC responsibility for establishing these materiel requirements and initiating ENSURE requests for these items. LTC M. J. Emmel, AUTOVON 555-3900, Extension 4265, is currently the action officer for ATOPS-PL-DOM.

3. This appendix is intended to familiarize the reader with the DA ENSURE program. The ENSURE program provides a means for applicable CONUS Army subordinate commands/agencies to obtain materiel items listed in the catalog which are required for riot control and for controlling civil disturbances.

4. ENSURE requests can be initiated for three purposes:

- a. Expedite development of new materiel.
- b. Acquisition of nonstandard items for evaluation.
- c. Acquisition of nonstandard items for operational use.

Per AR 71-1, requirements will be submitted to USCONARC in accordance with the inclosed format. It will contain, as a minimum, the following information:

- a. A statement that the requirement is an ENSURE action under the provisions of AR 71-1.
- b. A brief description of the requirements, problem area, and concept of employment.
- c. A brief description of the item, if known, and abbreviated performance characteristics.

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- c. A brief description of the item, if known, and abbreviated performance characteristics.

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- d. Type forces and organizations requiring the materiel, e.g., U. S. Army (Active), U. S. Army (Reserve), or U. S. Army National Guard Forces.
- e. Development or procurement objective (for evaluation purposes or full operational employment).
- f. Approximate quantity required and basis of issue.
- g. Personnel support required.
- h. Requirement for trained operator and maintenance personnel.
- i. Logistical support required.
- j. Desired delivery date.
- k. Issue priority designator of using unit(s) (See AR 725-50).

1 Incl
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APPENDIX F

ENSURE REQUEST FORMAT

SUBJECT: State the definitive nomenclature of the item being requested followed by the acronym (ENSURE). Upon receipt by DA (ACSFOR), a sequential number will be assigned to each individual request and will be used for ready identification in all subsequent correspondence.

REFERENCES: List all appropriate references.

1. Statement of request (In order for the Department of the Army to thoroughly and properly evaluate an ENSURE request, arrive at a sound decision as to its validity, and determine the materiel item best suited to fulfill the request, certain information must be provided by the requestor in the initial statement of the requirement. Stated ENSURE requests will include all information required below, if available and appropriate, and will conform to the prescribed sequential paragraph listing. Paragraph titles may be omitted in electrically transmitted messages unless titles are considered essential to clarity. Information required is to be of sufficient depth to minimize the flow of subsequent qualifying message traffic which unduly delays the processing of the request.)

a. State, "This is a new ENSURE request."

b. Describe briefly the materiel item in sufficient detail to identify the item by name, nomenclature, or required characteristics. Where prototype of item has been built, tested, and found satisfactory, list all components and quantity of each required to make up one item (e.g., armament subsystems to arm one helicopter). Where components are now used in a standard item, describe by FSN the standard item. Where components are not standard and have been designed in-theater, forward copies of drawings to DA, AMC, and/or appropriate NICP.

2. Operational concept. *a.* Describe briefly the associated problem and explain the conditions which have generated the ENSURE request. Include a discussion of the enemy threat and the means currently available and being used to meet the threat.

b. Discuss the operational concept envisioned to employ the requested item. As much as can be developed, consider and elaborate on known and/or predicted changes which will probably have to be incorporated in the tactics of normally supported or supporting unit(s).

3. Organizational concept. *a.* State whether item is for evaluation or for full operational use.

b. Identify the military forces which will use the ENSURE item (Army element of U.S., Indigenous, or FWMF).

c. For items requested for full operational use, list types of organizations which will use the new equipment by identifying the specific authorization documents (TOE/MTOE or TDA/MTDA) which will be used to reflect appropriate organizational, personnel, and equipment changes when and if the ENSURE item is issued. Further, state proposal for documentation of the requirement in accordance with AR 310-31, AR 310-44, and AR 310-49.

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INCLOSURE 1 TO
APPENDIX A

d. For items requested for evaluation, list specific units which will evaluate the equipment. Such items will be listed in the property book of the unit conducting the evaluation. Upon completion of the evaluation to determine operational acceptability of the item, proposed changes to authorization documents will be submitted as prescribed in *c* above, and AR 310-31 (for TOE) or AR 310-49 (for TDA).

e. Submit a tentative basis of issue plan (TBOI) (see AR 71-2).

f. List anticipated trade-offs of equipment and/or personnel and submit proposed plan for documenting changes in allowance made excess when and if the ENSURE item is issued.

4. Logistical aspects. *a.* State quantity of end items and ancillary equipment required.

b. State Desire Delivery Dates, including phasing.

c. State recommended logistical support requirements to include initial stockage level and, where applicable, recommended daily usage rate (e.g., items per day, rounds per day, miles per day).

d. Describe additional logistical support required, i.e., maintenance support activities; special tools; publications; technical advisers; special packaging, and other items deemed appropriate.

e. State proposal for documentation of the requirement (AR 310-31, AR 310-44, AR 310-49).

f. State shipping instructions to include exact designation of recipient(s) and special handling information to be contained in accompanying documentation.

5. Justification. *a.* Describe the shortcomings of any existing standard item which has been supplied or is available to meet the same or a similar requirement.

b. Describe the expected increase in effectiveness to be gained through use of the ENSURE item of equipment and how it will make a significant contribution to countering an enemy threat or meeting an existing need.

6. Feasibility. Describe and identify any known commercial, other service Government agency, or developmental item which it is considered will fulfill the proposed requirement. Include any recommended modifications or special considerations applicable to the item identified. Requestors should allow for alternative equipment which may be available from sources other than those known to the requestor.

7. Priority. Indicate recommended Issue Priority Designator (IPD).

8. Characteristics. *a.* List specific requirements (if not adequately stated elsewhere) to permit clear understanding of the features that are essential to acceptance of the item being requested. List also those features that are considered desirable.

b. Describe physical characteristics, to include: weight, size; mobility limitations; configuration; durability; environmental factors which must be considered; and requirement for compatibility with other systems.

9. Personnel and training considerations. *a.* Describe personnel impact (increase or decrease over present personnel, including operational, logistical, and administrative personnel).

b. Describe training considerations evolving from use of the new equipment.

(1) Describe special training that will be needed in connection with operation or maintenance of the equipment. State where and by whom this training will be conducted.

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(2) State trained replacement personnel requirements if any.

10. Associated considerations. Include:

- a.* Basic plan for evaluation of the materiel.
 - b.* Estimated period of evaluation required.
 - c.* Estimated time required to establish reliable logistical experience factors.
 - d.* Any other information which will contribute to a correct understanding of the requirement and related factors.
- • • • •

APPENDIX B

PERSONNEL INVOLVED WITH VARIOUS ASPECTS OF THIS RIOT CONTROL STUDY EFFORT

NAME	ORGANIZATION
Abbott, A.	CINFAC
Adams, B., Dr.	BAARINC
Barone, F.	RACIC
Blewett, MAJ	PMO - USCONARC
Campbell, D.	USALWL
Christodoulou, A. Dr.	BAARINC
Dame, H.	CINFAC
Dingeman, D., COL	PMO - USCONARC
Dunleavy, J.	RACIC
Egner, D.	USALWL
Ennel, M., LTC	DESOPS-PL USCONARC
Gage, H.	USALWL
Goddard, S.	RACIC
Hastings, W., LTC	USALWL
Hucek, H.	RACIC
Jackson, R.	RACIC
Jones, A.	CINFAC - Dept of Justice
Jones, W.	RACIC
Jureidini, P.	CINFAC
Light, H.	FBI
Lutz, G., Dr.	RACIC
Mays, L.	Dept of Justice
McNiell, J.	USALWL
Pierne, A.	USALWL
Price, J.	CINFAC
Roellke, D.	CINFAC
Ronig, D., MAJ	USALWL
Rosenthal, C., Dr.	CINFAC
Rudziak, COL	USACDCMPA
Salmon, R., GEN (Ret)	BAARINC
Samuels, D.	USALWL
Shelton, R., Dr.	USALWL
Sheriff, COL	USAMC
Sherman, R.	BAARINC
Sinaiko, H., Dr.	IDA
Stowell, J.	CINFAC
Thomas, R., LTC	OCRD
Under, J.	RACIC
Watson, F.	CINFAC
Williams, L.	RACIC
Wylar, E.	RACIC

UNCLASSIFIED

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11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY U.S. Army Limited War Laboratory Aberdeen Proving Ground, Maryland 21005
13. ABSTRACT This study is an attempt to provide some guidance to U. S. Army organizations concerned with the control of civil riots. The first part of the report analyzes such riots by identifying common characteristics of a number of disturbances which have occurred in the United States and describing the experiences of various security forces in their control. The latter part of the report serves as a catalog of materiel items, not already in the Army inventory, which may be useful in providing a more flexible response to the special requirements of riot control.		

DD FORM 1473

REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

UNCLASSIFIED

Security Classification

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT