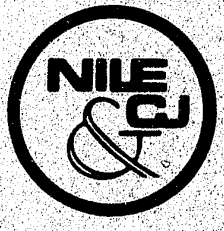
WASHINGTON OPERATIONS

PROTECTIVE GARMENTS FOR POLICE; PRELIMINARY USER OPINION SURVEY

MAY 1973

Equipment Systems Improvement Program Report

prepared for



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

MITRE

THE EQUIPMENT SYSTEMS IMPROVEMENT PROGRAM

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

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

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

---

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

THE MITRE CORPORATION

WASHINGTON OPERATIONS

WORKING PAPER

WP. 10280 ___ ___ ___ ___ ___
No. Vol. Series Rev. Supp. Corr.

CONTROLLED DISTRIBUTION

Subject: Protective Garments for Police; Preliminary User Opinion Survey

To: William E. Holden

Contract No.: F19628-73-C-0001

Sponsor: LEAA/NILECJ

From: Arthur Bruckheim

Project No.: 8160

Dept.: D-38

Page 1 of 22 Pages

Date: 25 May 1973

Approved for MITRE Distribution: Sterling I. Solomon

Sterling I. Solomon

ABSTRACT:

Information regarding police protective garments has been obtained from the MITRE-ESIP police field sites pertaining to the degree of protection desired and various garment characteristics, such as comfort, style, and cost. This information is summarized as a consensus of personal opinions based on responses to specific questions posed to the various police departments.

SUMMARY

Information concerning protective garments for police use has been obtained as a result of a survey of various field sites. Questions relating to comfort, cost, degree of protection, style, and environmental characteristics were submitted to the MITRE police field sites at Columbus, Indianapolis, Los Angeles, and East Lansing. As a result of this limited survey, the following initial findings are listed based on anticipated everyday usage.

1. The garment must be able to afford protection against a handgun up to .38 caliber. The extent of this protection is such that an officer shot by such a weapon will not lose consciousness, will not suffer permanent damage and will, at most, sustain a severe bruise.

2. The garment shall be in the form of an undershirt or short sleeve shirt.

3. The garment shall be inconspicuous such that to the casual observer, it would not be apparent that the officer was protected.

4. The cost of the garment shall be in the $40-$50 range.

5. The garment must be neat and wrinkle free and appear like the garment it replaces.

6. The garment must be comfortable when worn continuously for eight hours in both winter and summer conditions. In particular, the garment must provide adequate ventilation for 100% humidity and temperatures in the 90°F range and should cause no greater discomfort than the garment it replaces.

7. The garment shall cause no noticeable loss of mobility when worn.

8. The garment shall protect the chest, abdomen, back and groin. The last may require that the garment is configured in more than one piece.

9. The garment shall be easy to clean and launder and not have its wear life shortened by normal cleaning.

10. The garment shall be easy to put on and remove.

11. The garment shall be manufactured in several sizes for better fitting.

TABLE OF CONTENTS

1. INTRODUCTION

On 18 January 1973, a technical review meeting was held at Edgewood Arsenal to discuss requirements for protective garments for public officials. As a result of that meeting, MITRE was asked to provide, through its field site representatives, specific police user requirement data relating to protective garments. This document presents the results of a survey generated from the field sites as well as additional information discovered during the investigation.

Additional work is contemplated to generate a complete set of user needs, based upon analysis of exposure to dangerous situations and analysis of armed assaults on police officers.

2. STATEMENT OF THE PROBLEM

During the past decade, numerous police officers and public officials have been shot and killed. Some of these incidents could have been prevented if a suitable garment protecting the body had been available.

The U. S. Army Land Warfare Laboratory (LWL) under subcontract from the Aerospace Corporation has sought to develop an outer garment which would protect the wearer from the impact of a .38 caliber bullet. In addition, the garment would also have to meet appearance and comfort requirements. Besides the .38 caliber threat, more severe threat studies (i.e., 9 mm and .357 magnum) with emphasis on blunt trauma injury (i.e., a non-penetrating impact type injury) are also being carried out.

In order to apply newly acquired technology in lightweight body armor to police user needs, MITRE was asked to query its field site representatives to determine the type of garment that would most adequately satisfy the police officer who would wear it.

User information was obtained in response to the following questions:

1) What is the threat to the police user?
2) What clothing form should the protective garment take?
3) What would be the acceptable body damage in the event of a hit by the threat?
4) What would be the acceptable state of mobility of an officer after being hit by the threat?
5) What percentage of officers would require protective garments?
6) What is an acceptable cost range for the garment?
7) What are the environmental conditions under which the garment should be worn?

8) What would constitute an acceptable appearance of the garment?

9) What areas of the body should be protected?

3. APPROACH

Questions on police user requirements for protective garments were submitted to the MITRE field representatives for discussion with their respective host agencies. Comments were received from personnel in the following sites:

- Columbus Police Department
- Indianapolis Police Department
- Los Angeles Police Department
- Michigan State Police

The following discussion is directed at developing a consensus from the information received from the sites and makes recommendations based on that consensus.

3.1 Responses to Specific Questions

3.1.1 What is the Threat to the Police User?

Columbus Police Department

During 1972, Columbus experienced 24 reports of officer injury attributable to armed assaults. The primary circumstances under which a threat occurs appears to be during an arrest. One way of quantifying this threat is by determining those weapons used in incidents of aggravated assault. For the 115 incidents reported during 1972, the following weapons were used:

Weapon	Percent Occurrence
.22 caliber handgun	45%
.25 caliber handgun	9.5%
.32 caliber handgun	7.8%
.38 caliber handgun	7.8%
knives	14.8%
shotguns	7.8%
miscellaneous	7.8%

Indianapolis Police Department

In 1972 in Indianapolis, there were only two shootings and no knifings. In terms of potential threat, the following guns (with their respective percentages) were confiscated during 1972:

Weapon	Percent of All Confiscated Guns
9 mm.	2.5%
.22 caliber	46.6%
.38 caliber	43.5%
shotgun	7.3%

Los Angeles Police Department

The threat to the Los Angeles Police Department is defined as including .22 caliber, .357 magnum, .38 caliber, 9 mm., .45 caliber shotguns and .30 caliber carbines. In addition, the Special Weapons and Tactics Operations (SWAT) would have to contend with a 30.06 rifle and the 308 rifle. The percentage use of weapons was not quantified by the field site.

Michigan State Police

The following weapons were considered to be a threat to the officer in the field:

> .38 cal., .32 cal., .22 cal. pistols; knives; high powered rifles; and shotguns.

Conclusions

The Indianapolis and Columbus statistics for confiscated weapons and weapons used during aggravated assault seem to indicate that the .22 caliber and .38 caliber pistols are the main potential threats. One factor which may be associated with this is that these weapons are comparatively low in cost and are easy to conceal. Although a knife also possesses these characteristics, there was little response from the field to indicate that it should also be considered a prime threat.

3.1.2 What Clothing Form Should the Protective Garment Take?

Columbus Police Department

For everyday use, it was felt that a shirt or undershirt would be most desirable, with an undershirt preferred if the shirt is conspicuous. A jacket would be less desirable but would be acceptable if a garment for everyday wear was not feasible.

Indianapolis Police Department

Indianapolis makes the distinction between conspicuous and inconspicuous type garments which would be used under different circumstances. For a conspicuous garment, the prime considerations are that it be lightweight, easy to put on and off, allow freedom of movement and be comfortable. For the inconspicuous type garment, a body shirt or undershirt is desirable.

Los Angeles Police Department

In general operations, an undershirt or vest-type garment to be worn under the shirt is desirable. For SWAT operations, which involve high risk, an external garment which affords the maximum protection is required.

Michigan State Police

For low risk situations, an undershirt or shirt would be desirable. A long sleeve shirt would be preferable for protection against frequent arm and wrist injuries. In potential risk situations, a removable protective liner for a car jacket is preferable. For high risk cases, a protective outer garment providing maximum protection for all parts of the body is desired. In addition, a protective helmet with a face shield is also desirable.

Conclusions

For general purpose patrol, a shirt or undershirt is probably the best tradeoff between comfort and the type of threat likely to be encountered. A coat would appear to be unsatisfactory due to color and style variations which would be necessary in order to make the garment inconspicuous. The specific situation with its inherent risk also determines the type of garment required.

3.1.3 What Would be the Acceptable Body Damage in the Event of a Hit by the Threat?

Columbus Police Department

The acceptable body damage due to being hit by the threat would be a severe bruise or at most a broken bone.

Indianapolis Police Department

Indianapolis considers that acceptable body damage would be any injury from which the officer could quickly recover from shock and not be incapacitated for more than 1-2 seconds.

Los Angeles Police Department

For general operations, a bruise is the maximum damage deemed tolerable but for high risk situations, the requirement is simply that the officer survive.

Michigan State Police

The main concern of low risk and potential risk situations is to prevent permanent injury with the capture of a fleeing assailant of secondary importance. In high risk cases, for the critical frontal areas, there should be no noticeable body damage when receiving a hit. The back area should be similarly protected providing there is no appreciable loss of mobility.

Conclusions

The results from the field sites indicate that injuries, such as bruises, which do not result in permanent damage and enable the officer to quickly recover from the shock of being hit, constitute the acceptable body damage. For situations where the risk is high and is known a priori, the officer should be able to survive being hit. This type of situation usually involves a team effort so that it is expected that an officer would be hit once at most before other members of the team would scatter the opposition.

3.1.4 What Would be the Acceptable State of Mobility of an Officer After Being Hit by the Threat?

Columbus Police Department

The most important consideration is that the officer be able to defend himself against further attack. This implies that he be fully conscious and possibly be able to pursue an attacker.

Indianapolis Police Department

The acceptable state of mobility is defined as being able to attempt to incapacitate and apprehend a criminal at the site as well as using the police radio. Pursuit of the assailant is not of prime importance.

Los Angeles Police Department

The officer should be fully conscious and be able to return fire in order to prevent further attack.

Michigan State Police

For low risk situations, the officer should be fully conscious and able to defend against further attack. The ability to pursue is not considered of prime importance. In potential risk situations, the

mobility requirement is the same as for low risk situations. For high risk cases, the officer should be fully conscious but, because of the different type garment worn under this situation, a reduction in the degree of mobility compared to the other situations is expected.

Conclusions

The reports from the field all agree that the officer must be fully conscious and able to defend against further attack. If he is in such a state of mobility, then he can utilize the car radio to request either medical assistance for himself, if necessary, or help in pursuing and apprehending the assailant. Under high risk conditions, the nature of the garment is expected to cause some reduction in mobility.

3.1.5 What Percentage of Officers Would Require Protective Garments?

Columbus Police Department

If the garment were comfortable and of normal appearance, then all patrol and detective personnel would require garments. This comprises 85% of the force. If an everyday garment could not be fabricated but rather one which was kept in the vehicle and used by each shift as needed, then the figures could be reduced by one-third to an equivalent of 28% of the force.

Indianapolis Police Department

The feeling in Indianapolis is more towards an optional policy whereby officers would be permitted to purchase inconspicuous garments out of their $600 a year uniform allowance.

Los Angeles Police Department

There are 200 men in the Metropolitan Division with all of them requiring protective garments. In the SWAT branch, 100% of the men would also utilize a garment.

Michigan State Police

For low risk situations, approximately 60% (1200) of the MSP personnel would require protective garments compatible with the standard issue uniform. In potential risk situations, a definitive figure is not furnished here, although the philosophy is to tailor a garment to a specific individual rather than being assigned to a patrol car. For high risk cases, approximately 200 units (10% of enlisted force) would be required for issue to the posts and intelligence personnel.

Conclusions

There is no definite conclusion which can be drawn as to the percentage of officers requiring garments as the figures range from 10% of a force to 100%. Subsequent user need studies may clarify this point, i.e., reduce the variation.

3.1.6 What is an Acceptable Cost Range for the Garment?

Columbus Police Department

The department would be willing to invest up to $75 per garment for the type that would be stored in a vehicle and shared by several officers. For everyday wear, the department would increase its uniform allotment from $20 to $30 per man.

Indianapolis Police Department

The maximum cost per garment should not exceed $25.

Los Angeles Police Department

For several operations, a garment in the $40 to $50 range is acceptable. For higher risk SWAT operations, the expected cost of the garment would be $100.

Michigan State Police

For a demonstrated protection capability under low or moderate risk situations, a cost range of $25 to $80 would be acceptable for a corresponding type garment ranging from a shirt to a jacket. In high risk cases, a cost of $100 to $200 would be acceptable for maintaining two garments at each post.

Conclusions

The results from the field indicate an average acceptable cost of $50 for an everyday type garment used in general operations. Where higher risk is expected, the acceptable cost would be roughly $100 per garment. It is possible that a reduction in price could be obtained through quantity buying on a single department or cooperative multiple department basis.

3.1.7 What are the Environmental Conditions Under Which the Garment Would be Worn?

Columbus Police Department

The major environmental factors in this region of the country are heat and humidity. Therefore, a requirement on the garment is that it provide no more discomfort than a regular shirt or undershirt does in temperatures ranging from 80°F to 100°F at 80% to 100% humidity.

Indianapolis Police Department

Environmental factors to consider are heat, humidity, and rain. The garment should be comfortable under those conditions typical of the Indianapolis area.

Los Angeles Police Department

For standard operations, the environmental requirements include heat in the 80°F to 85°F range. Comfort is required under humid conditions as well as under dry or desert conditions. For higher risk situations, the environmental requirements vary although different inserts may be provided for use under a specific situation.

Michigan State Police

Since it is likely that the garment worn in low risk situations will be a shirt or undershirt, it is important that it be comfortable under warm and humid conditions. In potential risk situations the conditions for low risk apply as well even though some sacrifice could be made in terms of the officers' dress appearance. However, it should not be apparent to the casual observer that an armored role is being assumed. Comfort is not critical under high risk situations, however, the wearer should be able to negotiate entering and leaving a car.

Conclusions

Not surprisingly, as the risk involved increases, the level of comfort due to environmental conditions becomes less important since the garment should be as comfortable as a shirt or undershirt under hot and humid conditions. Obviously, certain areas of the country have stricter environmental requirements than others, but in general, the protective garment worn for everyday use should be no less comfortable than the garment it replaces.

3.1.8 What Would Constitute an Acceptable Appearance of the Garment?

Columbus Police Department

The prime consideration here is that the wearing of a protective garment be inconspicuous. The garment should look like the normal

garment it replaces and in no way detract from the neat appearance of the officer nor give any indication of protective qualities.

Indianapolis Police Department

If the garment is of the inconspicuous type, it should be neat with no visible bumps, folds, or wrinkles. If the garment is conspicuous, then it is obvious that the wearer is being protected and an impregnable appearance is desired.

Los Angeles Police Department

For general operations, the garment should not be obvious. It is the opinion of the Los Angeles Police Department that a garment which looks protective would encourage the suspect to aim for the head. For high risk conditions, protection is primary and the garment can be obvious.

Michigan State Police

For low and moderate risk cases, the garment should be neat looking and have a reasonable wear life as well as easy cleaning characteristics. The appearance of the garment is not a primary consideration in high risk applications.

Conclusions

The unanimous response from the field sites is that the garment appear neat and clean with no visible evidence of protection when used in an everyday capacity. When the situation becomes more risky, then protection is the most important consideration and the appearance of the garment is secondary.

3.1.9 What Areas of the Body Should be Protected?

Columbus Police Department

The areas of the body requiring protection are the chest, back, abdomen and groin. Other areas mentioned less frequently are legs, arms and neck.

Indianapolis Police Department

The most important areas of the body to be protected are the chest, shoulders, abdomen and groin. Of less importance are arms, legs, and neck.

Michigan State Police

The chest area and arms are the areas which should be protected for low and moderate risk cases. In high risk situations, the frontal areas such as the groin, abdomen, chest and shoulders should be protected provided it does not restrict mobility. A protective helmet would be welcomed under this type of situation.

Conclusions

The responses from the field all agree that the chest and abdominal areas are critical and must be protected. The extremities such as arms and legs do not require protection. The back area should be protected if there is no loss in mobility. Protection of the neck and groin may be difficult to provide while maintaining a satisfactory level of comfort. The specification of the areas to be protected indicates a garment similar to a sleeveless shirt or undershirt for protection of the frontal areas. The responses also suggest an athletic supporter or cup for protection of the groin area.

4. ADDITIONAL USER COMMENTS

A number of comments were received in addition to the responses to the questions discussed in Section 3. These comments are indicated below.

4.1 Intelligence Activities

For certain types of work such as intelligence or undercover activities, protective garments in the form of casual street clothes are greatly needed. In particular, the Michigan State Police indicate that the threat from handguns is greatest for this type of situation. In order to provide adequate protection, the garment should be in the form of an undershirt or sweatshirt and protect the chest, abdomen and groin. Prevention of a fatal injury is very important. The garment could be loosely fitted in order to allow several people to wear it. Approximately 5% of the force would utilize the garment for this activity.

An additional requirement for this type of activity is that the garment be extremely flexible since a lot of running might be entailed. Furthermore, there should be no loose ends or dangling straps which could snag on a fence or bush. Los Angeles also indicates that the threat of .45 caliber and .44 magnums are routine and to be expected in intelligence activities.

4.2 Comfort vs. Protection

As a result of the survey of the Columbus Police Department, it became apparent that most officers would tolerate increased weight for added protection. However, this additional weight has a limit in that if the garment becomes uncomfortable, the wearer will discard it. As an example, the United States Army had experience in Vietnam where troops, despite apparent risk, buried their flak vests because the garment was not comfortable.

4.3 Laundering Characteristics

The Indianapolis site made note of the fact that many officers were concerned with the problems of laundering the garment. The desire was expressed that the garment be permanent press with wash and wear characteristics. In addition, normal washing and cleaning should not cause the wear life of the garment to be reduced.

5. INITIAL FINDINGS

Throughout the analysis of the field responses, it has become evident that the requirements on a protective body garment are a function of its intended use. However, it is also apparent that in the majority of circumstances, the garment will be used in a daily capacity on routine patrol. Thus, based on this limited survey, the following initial findings are listed based on anticipated everyday usage.

1. The garment must be able to afford protection against a handgun up to .38 caliber. The extent of this protection is such that an officer shot by such a weapon will not lose consciousness, will not suffer permanent damage and will, at most, sustain a severe bruise.

2. The garment shall be in the form of an undershirt or short sleeve shirt.

3. The garment shall be inconspicuous such that to the casual observer, it would not be apparent that the officer was protected.

4. The cost of the garment shall be in the $40-$50 range.

5. The garment must be neat and wrinkle free and appear like the garment it replaces.

6. The garment must be comfortable when worn continuously for eight hours in both winter and summer conditions. In particular, the garment must provide adequate ventilation for 100% humidity and temperatures in the 90°F range and should cause no greater discomfort than the garment it replaces.

7. The garment shall cause no noticeable loss of mobility when worn.

8. The garment shall protect the chest, abdomen, back and groin. The latter may require that the garment is configured in more than one piece.

9. The garment shall be easy to clean and launder and not have its wear life shortened by normal cleaning.

10. The garment shall be easy to put on and remove.

11. The garment shall be manufactured in several sizes for better fitting.