



INSPECTOR GENERAL
DEPARTMENT OF DEFENSE
400 ARMY NAVY DRIVE
ARLINGTON, VIRGINIA 22202-2884

REPORT
NO. 92-103

June 17, 1992

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (FINANCIAL
MANAGEMENT)

SUBJECT: Quick-Reaction Report on the Army Repair of Components
Made of Kevlar and Disposal of Materials Used During
Kevlar Repairs (Project No. 1LB-0050.02)

Introduction

We are issuing this quick-reaction report as part of our Audit of Repair of Weapon Systems Containing Advanced Composite Materials (Project No. 1LB-0050). The overall objective of the audit was to evaluate the Military Departments' capabilities to repair weapon systems containing advanced composite materials. As part of the audit, we evaluated the Army's capabilities to protect the health of its personnel during the repair of weapon systems containing kevlar, and to protect personnel and the environment from the residue of materials produced during the repair process.

Army repair and disposal operations involving kevlar are endangering Army personnel and threatening the environment. This condition exists because the Army has not published updated safety information and Army units were not following existing regulations. The Army can avoid health and environmental problems and their associated costs by improving procedures and practices. The Army agreed to reinforce and expand guidance on the proper repair of components made of kevlar and disposal of materials used during the repairs.

Scope of Audit

We reviewed records covering the period from December 1988 through February 1992 documenting the repair of advanced composite materials and disposal of residue produced during the Army's repair operations. We also visited locations where Army personnel obtain training in the repair of components made of kevlar and visited operational Army units that routinely repair advanced composite materials. We evaluated methods being used to protect personnel during the repair of components made of kevlar and to dispose of materials used in the repair process. This portion of the audit was made from December 1991 through February 1992 in accordance with auditing standards issued by the Comptroller General of the United States for economy and efficiency audits, as implemented by the Inspector General, DoD,

and accordingly, included such tests of internal controls as were considered necessary. Activities visited or contacted during the audit are listed in Enclosure 3.

Internal Controls

The audit identified material internal control weaknesses as defined by Public Law 97-255, Office of Management and Budget Circular A-123, and DoD Directive 5010.38. Controls were not effective to ensure that the Army protected the health of its employees and the environment. Recommendations in this report, if implemented, will assist in correcting these weaknesses. A copy of this report will be provided to the senior officials responsible for internal controls in the Army.

Background

Kevlar is one of the Army aviation community's most frequently used advanced composite materials. It is used to form components of several of the Army's active aircraft, including the AH-64 Apache and the UH-60 Blackhawk helicopters. Although there are no Occupational Safety and Health Administration standards for airborne particles of kevlar, the Material Safety Data Sheet published by the manufacturer of kevlar provides health hazard information about the material. The safety sheet states that repeated and prolonged inhalation of excessive concentrations of respirable fibers of kevlar may cause permanent lung damage. The Environmental Protection Agency's document "Health Hazard Assessment of Non-asbestos Fibers," published in 1988, proposed that ultra fine aramid fibers (including kevlar fibers) be classified as possible human carcinogens.

In addition to kevlar fibers, the resin that is combined with kevlar, epichlorohydrin epoxy resin, also presents an inhalation hazard during the mixing, applying, and curing of the composite patch. Army correspondence indicated that this resin is considered a carcinogen by multiple routes, including inhalation, and is classified as a probable human carcinogen by the International Agency for Research on Cancer.

The Army procured technical manuals for each aircraft specifying safety precautions that must be followed during the handling of advanced composite materials, such as kevlar, and materials used during the repair of kevlar. The Army's technical manual for the Apache helicopter, Technical Manual 55-1520-238-23, and the technical manual for the Blackhawk helicopter, Technical Manual 55-1520-237-23, require that personnel working with kevlar wear protective clothing, eye protection, and respirator equipment.

The repair of Army aircraft containing kevlar can also generate hazardous waste. Army Regulation 200-1 prescribes the responsibilities, standards, and procedures for the efficient and economical collection, recycling, and disposal of solid and hazardous waste.

Discussion

Health hazards of kevlar. In 1990, at the Army Aviation Repair School, Fort Eustis, Virginia, the Army conducted studies of the health and safety dangers that exist during repair of kevlar. On April 5, 1990, the Medical Department Activity at Fort Eustis recommended suspending "hands on" training at the school because engineering controls on personal protective equipment did not exist. There was concern that students and instructors would be exposed to kevlar fibers and dusts as well as epoxy resin system chemicals used during repairs.

On April 20, 1990, the Medical Department at Fort Eustis noted that there was no Army-wide guidance on personal protection measures to be used during maintenance and repair training on advanced composite materials. The Medical Department found that inhaling contaminants was a major health hazard to students.

In March 1991, the Army Environmental Hygiene Agency performed an Industrial Hygiene Study of Composite Material Repair for the Army Aviation School at Fort Eustis. It found that the levels of emissions generated during hand sanding of kevlar did not warrant the use of a respirator, but that protective gloves should be used. However, based on the levels of the emissions found during its study, the Agency concluded that respirators and protective gloves were both needed when performing drilling and cleanup work on components containing kevlar. It also concluded that the use of routing equipment to repair damaged aircraft skins containing kevlar should be prohibited unless additional sophisticated vacuum equipment is used for protection. As a result of the findings, additional vacuum equipment was installed at Fort Eustis, and additional measures were taken to ensure that personnel wore respirators and protective clothing.

Personnel at the Army's aviation repair facilities at Fort Hood, Texas, also found repairs on kevlar to be problematic. Fort Hood maintenance personnel documented five incidents of health problems in 1990 that they attributed to repair work on kevlar. The incidents included difficult breathing, bleeding from the nose, and ulcerations of the stomach. As a result, Fort Hood began construction of a kevlar repair booth in August 1991, where all repairs on kevlar panels for AH-64 and UH-60 helicopters would be performed.

Despite the Army's efforts to improve operations at Fort Eustis and Fort Hood, other Army activities were not aware of the findings and were not taking precautions to make sure adequate safety procedures were followed.

Our review of Army aviation components at Fort Bragg, North Carolina, and Hunter Army Airfield, Georgia, indicated that respirators, protective clothing, and other safety equipment, such as downdraft vacuums, were not issued or were not used to protect personnel and to capture the residue produced during the grinding of kevlar. Personnel at maintenance activities at Fort Bragg and Hunter Army Air Field were performing routine repairs on components made of kevlar but only one of the six maintenance units we visited at those locations used respirators. All other maintenance activities either had no respirators on hand or did not use them.

The only protective clothing we observed being used at the six maintenance units we visited were gloves, and only one of these units was using chemical resistant gloves that provided adequate skin protection. This maintenance unit was located at Hunter Army Airfield. The other five maintenance units visited had only disposable latex gloves and cotton gloves available. Material Safety Data Sheets issued by the manufacturers stated that latex and cotton gloves did not provide adequate protection from the solvents, resins, and adhesives that were being used by the Army during the repair of components containing kevlar.

Ventilation at the repair facilities did not adequately protect personnel. Repairs on kevlar were performed in the sheet metal shop and mobile workshops where ventilation was generally poor; and there was little attempt to isolate dust or vapors from other workers or equipment. At Fort Bragg, any dust or debris resulting from sanding or grinding was swept away using a dry broom. The sweeping action raised the particles back into the air and again posed a health hazard.

Fort Bragg personnel also expressed concern that access to the work areas where kevlar repairs were performed was not limited to employees performing repair operations. Foot traffic from other employees transferred the particles throughout the maintenance area. Additionally, resins, adhesives, and solvents were being mixed and cured in the general work areas and the vapors were allowed to circulate throughout the maintenance area.

Efforts to disseminate information. Army Materiel Command's field scientist at Fort Hood called attention to the problems experienced by personnel at Fort Hood during work on advanced composites and briefed personnel at Headquarters, Army Materiel Command. However, personnel in Headquarters, Army Materiel Command, indicated that it was the responsibility of the major

commands to investigate and alert their subordinate activities to the potential hazards and any increased safety precautions that need to be taken to lessen the dangers of working with advanced composite materials such as kevlar.

Personnel at Army Materiel Command and Fort Eustis indicated that they had informed the Army's Aviation Systems Command (AVSCOM) about the problems and the results of studies that were performed. However, there was no evidence that AVSCOM had investigated the hazards of kevlar repair operations and issued further guidance. Information provided by AVSCOM indicated that the Army Environmental Hygiene Agency began developing industrial hygiene procedures in May 1990. However, Army Environmental Hygiene Agency personnel indicated that although they had begun work on procedures in 1990, the procedures were never completed. The Agency started another study on kevlar's health hazards in January 1992. The study was self-initiated and is being performed at the Corpus Christi Army Aviation Depot, Texas, where sophisticated protective vacuum systems already exist.

Safe disposal of materials used during repair of components made of kevlar. Fort Bragg was not disposing of materials used during repairs of components made of kevlar, including hazardous adhesives, in accordance with prescribed safety procedures. Another activity, Hunter Army Airfield, did not document how it disposed of material used in repair of kevlar.

Fort Bragg. At Fort Bragg, a large quantity of hazardous waste materials including epoxy resins, adhesives, and solvents were thrown haphazardly in storage buildings located outside the repair facilities. Some of the materials were considered usable, but most had exceeded their expiration dates or had been stored at improper temperatures and had spoiled. Some of the materials had expired in 1988 and a number of the containers were open and seeping.

At the time of our audit, none of the materials had been inventoried. After our review of the materials, the Environmental Officer at Fort Bragg conducted an inspection. Based on the Environmental Officer's assessment, an inventory of the materials was conducted in February 1992.

The inventory listed more than 100 quarts of adhesives and resins in the storage areas, such as EA 934. EA 934 is a two part epoxy material that is used frequently in the repair of advanced composite materials. The manufacturer of EA 934 prepared a material safety data sheet that listed the hazardous ingredients and safety precautions for use and disposal of the material. The data sheet stated that EA 934 must be disposed of as hazardous waste.

Because the material contains hazardous ingredients, Army Regulation 200-1 requires that any waste be transferred to the Defense Reutilization and Marketing Office (DRMO) for processing and eventual disposition. The DRMO is responsible for ensuring that the material is disposed of in accordance with applicable Federal and state laws and regulations. DRMO records for the last 2 years showed that no materials used in kevlar repairs had been turned in for disposal as hazardous waste at Fort Bragg.

Hunter Army Airfield. The Safety Officer at Hunter Army Airfield indicated that after deployment of aviation units to the Middle East in 1991, the Army had discarded large quantities of materials that were used in kevlar repairs as nonhazardous materials, including adhesives and resins. The materials were not treated as hazardous and were disposed of as solid waste. However, no records existed to substantiate this claim. No records existed on the amount of spoilage or excess materials that the Army generated during its kevlar repair operations at Hunter Army Airfield since the Persian Gulf war.

Our examination of the records for the adhesives and resins normally used during kevlar repair operations showed no excess materials, or materials that exceeded their shelflife, at Hunter Army Airfield. We found this situation to be unusual. Most of the adhesives used in kevlar repairs have a short shelflife and the experience of other Army aviation activities is that there is significant spoilage.

Conclusions

Army aviation activities involved in the repair of components made of kevlar were not taking consistent precautions to protect personnel from possible health problems and avoid release of contaminants into the environment. There is a considerable amount of conflicting information within the Army concerning the safety procedures needed during repair of components made with kevlar. We concluded that the Army was not collecting data on the results of studies and providing consolidated guidance to its field activities.

The Army has hazardous waste management programs and plans, but personnel working with hazardous materials used in repair of components made of kevlar appeared to be unfamiliar with which materials were hazardous and the procedures for proper storage, handling, and disposal of hazardous materials. The IG, DoD, issued Report No. 89-111, "Audit of Management of Hazardous Waste Disposal Contracts," in FY 1989. The report indicated that hazardous waste was being incorrectly identified and quantified because military installations did not adequately implement hazardous waste management plans. We concluded that the

conditions regarding materials used in advanced composite repairs still exist. Additionally, controls such as hazardous waste management plans were not being implemented.

This audit focused on the repair of Army aviation weapon systems. However, kevlar and the adhesives used during the repair of components made of kevlar are found in other Army nonaviation systems. Updated information concerning the hazards of these materials is needed throughout the Army.

Enclosure 1 provides a summary of the benefits that can be obtained from implementing this report's recommendations.

Recommendations

We recommend that the Army Deputy Chief of Staff for Logistics:

1. Publish and distribute guidance to all Army activities involved in the repair of components made of kevlar setting forth procedures for ensuring that optimum safety procedures and techniques are followed during the repairs. This guidance should incorporate the information generated through the studies conducted of health risks associated with advanced composite material repairs at Fort Eustis.

2. Require each Army field activity to provide information on proper disposal procedures to all units that are involved in the disposal of materials used during repair of components containing kevlar.

Management Comments

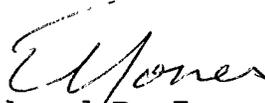
Comments prepared by the Army Environmental Hygiene Agency (through the Army Health Services Command and Army Office of the Army Surgeon General) on behalf of the Army Deputy Chief of Staff for Logistics concurred with the recommendations. The complete text of the Army's comments is in Enclosure 2.

Audit Response

The Army's comments are responsive. No further comments are required.

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The courtesies extended to the audit staff are appreciated. If you have any questions on this audit, please contact Mr. Dennis E. Payne at (703) 692-3414 (DSN 222-3430) or Mr. James L. Kornides at (703) 692-3420 (DSN 222-3430). Audit team members are listed in Enclosure 4. The distribution of this report is listed in Enclosure 5.



Edward R. Jones
Deputy Assistant Inspector General
for Auditing

Enclosure

cc:
Secretary of the Army

SUMMARY OF BENEFITS RESULTING FROM AUDIT

<u>Recommendation Reference</u>	<u>Description of Benefit</u>	<u>Amount and/or Type of Benefit</u>
1.	<u>Economy and Efficiency.</u> Army can avoid the cost of health problems by ensuring the necessary safety practices are used during repair operations on components composed of kevlar.	<u>Funds Put to Better Use.</u> Monetary benefits cannot be quantified.
2.	<u>Economy and Efficiency.</u> Army can avoid the cost of environmental problems by ensuring the residue materials produced during kevlar repairs are properly disposed.	<u>Funds Put to Better Use.</u> Monetary benefits cannot be quantified.

DEPARTMENT OF THE ARMY COMMENTS



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
OFFICE OF THE SURGEON GENERAL
5100 LEESBURG PIKE
FALLS CHURCH, VA 22041-3258



DASG-IRO

21 May 1992

MEMORANDUM FOR THE *Assistant Inspector General (Auditing), DOD*
~~ARMY INSPECTOR GENERAL, ATTN: MG. FLANAGAN, PAF~~
~~ROOM 1E-721, PENTAGON, WASHINGTON, D.C. 20310~~

SUBJECT: IG DOD Draft Report on the Army Repair of Components
Made of Kevlar and Disposal of Materials Used During Kevlar
Repairs (Project No. ILB-005-02)

1. This is in reference to your request, dated 4 May 1992,
subject as above. I have requested HSC to solicit input from
the Army Environmental Hygiene Agency. Enclosed is the Agency
comments to implement IG DOD recommendations.

2. I will appreciate your assistance to close the status on
subject recommendations. If you have any questions, please
call me at 756-0248.

SAMIH H. HELMY
Chief, Internal Review Office

Encl

CF:
DASG-ZX

DEPARTMENT OF THE ARMY COMMENTS (cont'd)

HSIR (DASG-IRO/4 May 92) (36-2b) 1st End Mr. Ramzinski/tb/
DSN 471-6500
SUBJECT: IG DOD Draft Report on the Army Repair of Components
Made of Kevlar and Disposal of Materials Used During Kevlar
Repairs (Project No. ILB-005-02)

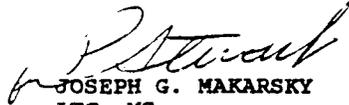
HQ, U.S. Army Health Services Command, Fort Sam Houston,
TX 78234-6000 20 MAY 1992

FOR HQDA (DASG-IRO), 5109 Leesburg Pike, Falls Church,
VA 22041-3258

We are providing the U.S. Army Environmental Hygiene Agency
(USAEHA) comments in accordance with your request in basic
memorandum.

FOR THE COMMANDER:

2 Encls
wd encl 1
Added 1 encl
2. USAEHA cmts


JOSEPH G. MAKARSKY
LTC, MS
Chief, Administrative Services
Division

DEPARTMENT OF THE ARMY COMMENTS (cont'd)



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
OFFICE OF THE SURGEON GENERAL
5109 LEESBURG PIKE
FALLS CHURCH, VA 22041-3258



DASG-IRO

4 May 1992

MEMORANDUM FOR COMMANDER, U.S. ARMY HEALTH SERVICES COMMAND,
ATTN: HSIR, FORT SAM HOUSTON, TX 78234-6000

SUBJECT: IG DOD Draft Report on the Army Repair of Components
made of Kevlar and Disposal of Materials Used During Kevlar
Repairs (Project No. ILB-005-02)

1. The enclosed IG DOD draft report and Office of the Deputy Chief of Staff for Logistics memorandum are forwarded to your office for review and comments. DALO requested that the Army Environmental Hygiene Agency issues a message and develops interim safety procedures.
2. Please provide comments to define the Army Environmental Hygiene Agency's position for implementing subject recommendations. I will appreciate receiving your reply NLT 15 May 1992. If you have any questions, please call me at DSN 289-0248.

Encl

SAMIH H. HELMY
Chief, Internal Review Office

CF:
DASG-ZX

DEPARTMENT OF THE ARMY COMMENTS (cont'd)

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DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010-5422



REPLY TO
ATTENTION OF

HSHB-MI-WR (40)

MAY 20 1991

MEMORANDUM FOR Commander, U.S. Health Services Command, ATTN:
HSTR, Fort Sam Houston, TX 78234-6000

SUBJECT: Inspector General, Department of Defense, Draft Quick-
Reaction Report on the Army Repair of Components Made of Kevlar¹
and Disposal of Materials Used During Kevlar¹ Repairs

1. We have provided comments pertaining to the recommendations
contained in the subject report, as follows:

a. Concur with paragraph 1, page 8 of the subject report.

(1) We are developing technical guidance on the "Safe
Handling of Composite Materials". This guidance should be
available to the Army by 30 November 1992, and will address
materials used in advanced composite operations, such as
reinforcing materials (e.g., aramid, textile fibrous glass, and
carbon/graphite), resins and hardeners, prepregs, adhesives, and
solvents. This time is required to allow for the acquisition of
additional sampling data, and a multi-disciplinary internal
review of the document by Industrial Hygienists, Mechanical
Engineers, Occupational Medicine Physicians, Toxicologists,
Environmental Scientists, and Chemists.

(2) To aid in the information acquisition, we request
that all Army Installations inspected by the Department of
Defense Inspector General, and all installations that have
advanced composite material, send the following information no
later than 1 July 1992 to the U.S. Army Environmental Hygiene
Agency (USAEHA):

¹Kevlar is a registered trademark of E.I. DuPont de Nemours and
Company for aramid synthetic fibers. Use of trademarked names
does not imply endorsement by the U.S. Army, but is intended to
assist in identification of a specific product.

Nationally Recognized as the Center of Military Occupational and Environmental Health Excellence

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DEPARTMENT OF THE ARMY COMMENTS (cont'd)

HSHB-MI-WR

SUBJECT: Inspector General, Department of Defense, Draft Quick-
Reaction Report on the Army Repair of Components Made of Kevlar
and Disposal of Materials Used During Kevlar Repairs

(a) A point-of-contact, a list of items containing composites (including locations and percentage by weight composite), type of composite materials (specific reinforcing fiber and matrix), operations and potential for occupational exposure, list of resins and hardeners used and how applied, list of prepregs and adhesives used, list of solvents used, controls (e.g., protective clothing, gloves, respirators, ventilation) used when handling composite materials, air sampling data from various operations (e.g., composite repair; manufacturing/fabrication; laboratory or field research; Health Hazard Assessments) and information regarding health effects experienced by individuals while working with any of the composite materials.

(b) The following information should accompany the air sampling and health effects data:

- The operation being performed. For example, sanding, grinding, cutting, drilling, wet lay-up, mixing or weighing resins and hardeners, brushing on mixed resin and hardener, wiping down or spraying with solvent, curing at room temperature, lay-up with prepreg and adhesives, vacuum bagging, curing in autoclave or oven, etc.

- The contaminant(s) present: fiber(s) (identify the type, and as respirable or nonrespirable); total composite dust (e.g., fiberglass-epoxy, fiberglass-polyester, aramid-epoxy, aramid-phenolic, carbon- or graphite-epoxy, carbon- or graphite-bismaleimide, ceramic, boron, etc.); respirable composite dust (see total composite dust for examples), metals (e.g., lead chromate, as chrome; lead; hexavalent chromium; zinc chromate, as chrome; aluminum; copper; titanium; zinc), resins (e.g., epichlorohydrin from epoxy resins made with epichlorohydrin), hardeners (e.g. diethylenetriamine, methylene dianiline), solvents (e.g., methyl chloroform, methylene chloride, methyl ethyl ketone, methyl alcohol, acetone), and pyrolysis or combustion products (e.g., hydrogen chloride, carbon monoxide, nitric oxide, nitrogen dioxide, sulfur dioxide, etc.).

DEPARTMENT OF THE ARMY COMMENTS (cont'd)

HSHB-MI-WR

SUBJECT: Inspector General, Department of Defense, Draft Quick-
Reaction Report on the Army Repair of Components Made of Kevlar¹
and Disposal of Materials Used During Kevlar¹ Repairs

- The air sampling and analytical method.

Differentiate between general area and breathing zone samples and identify as time-weighted average, short-term exposure limit or ceiling concentration. Identify air sampling interval concentrations and duration of the operation (e.g., this concentration represents 1 continuous hour out of a normal 8 hour work day, or 15 minutes out of a 10-hour work day, or continuous exposure of 7 hours out of 8-hour work day).

The engineering controls used at the time the air sample was taken. For example, down-draft table, sander with or without built-in ventilation, the RPM (e.g., 10,000 RPM) of the tool (e.g., sander, router, drill), the grit of the sandpaper used (where applicable), or laboratory hood.

- The type of protective clothing, gloves(s), or respirator worn. Be specific.

(3) We request the Army send us a copy of each technical manual for field repair of each item in the Army containing advanced composite material.

(4) We request the Army provide us with information regarding future procurement or use of advanced composite materials.

(5) Send requested information no later than 1 July 1992 to:

Commander
USAEHA
ATTN: HSHB-MI-WR/Mr. Christopher H. Carroll
APG-EA, MD
21010-5422

DEPARTMENT OF THE ARMY COMMENTS (cont'd)

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HSNB-MI-WR

SUBJECT: Inspector General, Department of Defense, Draft Quick-
Reaction Report on the Army Repair of Components Made of Kevlar
and Disposal of Materials Used During Kevlar Repairs

b. Concur with paragraph 2, page 8.

(1) Improper disposal of hazardous wastes is a common observation made by USAEHA personnel during our Environmental Program Reviews (other agencies have also identified this issue). We feel that these problems are frequently due to a lack of training among maintenance personnel. Increased training for maintenance personnel on general disposal policies and specific disposal procedures about the materials in their workplace would greatly aid in the resolution of this problem. These types of problems are addressed by the Army Environmental Master Training Plan currently under development by the U.S. Army Toxic & Hazardous Materials Agency.

(2) One of our missions is to develop disposal guidance for military items. We recommend that the U.S. Army Aviation Systems Command provide us with a list of all of the components used during Kevlar repairs along with the manufacturers (since different manufacturers will have different ingredients for the same product under a given NSN) of these components. We will develop disposal guidance for these materials and include the disposal guidance in USAEHA Technical Guide-126, Waste Disposal Instructions, USAEHA technical guidance on the "Safe Handling of Advanced Composite Materials", and USAEHA MIDI (Military Item Disposal Instructions) compact disc. The U.S. Army Aviation Systems Command can include the guidance in the maintenance technical manual.

2. We have also provided comments to the findings contained in the subject report - see enclosure.

3. We will issue interim Army health and safety guidance for the "Safe Handling of Advanced Composite Materials" by 31 July 1992. The interim guidance should be used by the Army until the detailed technical guidance is issued in November 1992.

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DEPARTMENT OF THE ARMY COMMENTS (cont'd)

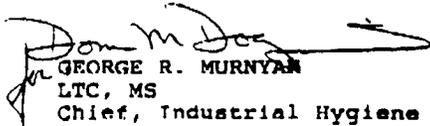
HSHB-MI-WR

SUBJECT: Inspector General, Department of Defense, Draft Quick-
Reaction Report on the Army Repair of Components Made of Kevlar¹
and Disposal of Materials Used During Kevlar¹ Repairs

4. Our point of contact is Mr. Christopher H. Carroll,
HSHB-MI-WR, DSN 584-3144 or FAX (410) 671-3665.

FOR THE COMMANDER:

Encl


GEORGE R. MURNYAN
LTC, MS
Chief, Industrial Hygiene Division

ACTIVITIES VISITED OR CONTACTED

Office of the Secretary of Defense

Assistant Secretary of Defense (Production and Logistics),
Washington, DC

Department of the Army

Secretary of the Army (Deputy Chief of Staff for Logistics),
Washington, DC
Army Materiel Command, Alexandria, VA
Aviation Systems Command, St. Louis, MO
Fort Bragg, NC
Hunter Army Airfield, GA
Fort Hood, TX
Fort Campbell, KY
Fort Eustis, VA

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Dennis E. Payne, Program Director
James L. Kornides, Project Manager
Jose J. Delino, Team Leader
Gerald P. Montoya, Team Leader
Steven G. Schaefer, Auditor

REPORT DISTRIBUTION

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