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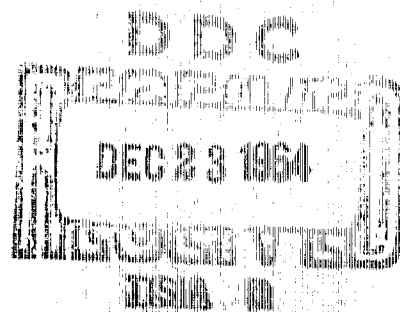
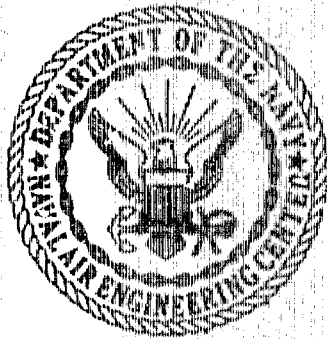
REPORT NO. NADC-AML-2050

DATE 2 October 1964

METHODS OF SANITIZING AND DEODORIZING RUBBERIZED FABRIC AND PRODUCING TEMPORARY ANTI-STATIC FILMS ON SYNTHETIC MATERIALS

PROBLEM ASSIGNMENT NO. 2-22 UNDER BUREAU OF NAVAL WEAPONS WEPTASK REMA 04 013/200 1/ROOL 02 01

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PHILADELPHIA, PENNSYLVANIA 19112

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ABSTRACT

An investigation of sanitizing, deodorizing, and anti-static agents is described. Recommendations are made for the use of quaternary ammonium compounds for sanitizing and deodorizing rubberized flight clothing and for the use of non-ionic detergents for rendering synthetic materials anti-static.

I. INTRODUCTION

Perspiration odors are prevalent in rubberized flight clothing that is not well ventilated during use. In addition the increasing use of synthetic fibers tends to promote danger from static build-up. To minimize these conditions Problem Assignment Number 2-22 was established. It was requested that MIL-C-18687 Cleaning Compound, Aircraft Surfaces be revised to include two additional classes of material. One class would be for deodorizing and sanitizing while the second would be for depositing an anti-static film on the fabric surface.

II. INVESTIGATION PROCEDURES

A. Discussion

1. Although fresh perspiration is essentially odorless and sterile, upon contact with the skin, bacteria thereon act upon the various components to produce the typical odors which are so obnoxious. Consequently, when perspiration saturates clothing it carries with it many thousands of skin bacteria which produce an objectionable odor in clothing even though their growth and activity may have been inhibited while on the skin.

2. Bactericides generally fall into three groups: (1) phenolics, (2) iodophors, and (3) quaternary ammonium compounds. The phenolics have a typical "hospital smell" and are usually employed in heavy concentrations. Iodophors have a subdued odor and may be used in dilute solution. However, they are most useful in a pH range of three to four, hence are not satisfactory when used with alkaline detergents. Quaternary ammonium compounds are odorless as well as useful in dilute solutions. They may be combined with non-ionic and cationic detergents but are incompatible with soap or other anionic detergents.

3. Anti-static agents are generally surface active agents that deposit a very thin film on a surface. This film retains moisture which in turn retards the build-up of static charges.

B. Survey

1. Information was obtained from several air stations regarding the care and cleaning of rubberized flight clothing. Since pressure suits are tailored to the individual, very few are located at the air stations. However, useful information and comments were obtained on the cleaning and repair of exposure suits. Subsequent discussions with operating personnel disclosed that the problem was more troublesome to carrier-based squadrons than to land-based squadrons.

2. The results of this survey disclosed that when the suits were stored in well-ventilated, temperature-controlled drying lockers, the disagreeable odors could be kept to a minimum. The problem becomes acute when the pilot is transferred or exposure suits shipped to repair points. In these cases the clothing is usually tightly folded and placed in an unventilated

container. This situation encourages the growth of odor causing bacteria. The survey also disclosed that the build-up of static charge creates a potential hazard that should be controlled or eliminated.

C. Existing Specifications

1. Two detergent specification have been examined:

a. MIL-C-18687A is a specification covering cleaning compounds for aircraft surfaces. There are two chemical types of material. The detergents may be Type I, anionic or Type II, non-ionic. The material procured thereunder is a relatively low cost item and is consumed in large quantities. It is listed as an aircraft cleaning compound and, therefore, would be difficult to locate in stock catalogues if the specification were revised to include a sanitizing agent for flight clothing.

b. MIL-D-0016791 covers non-ionic detergents. These compounds are essentially 100 percent active materials. In addition to acting as detergents they are useful as anti-static agent in dilute solutions. The materials covered by Type I of the specification are compatible with many of the bactericides investigated. The detergents covered by this specification are not considered biodegradable.

2. Three specifications covering bactericidal compounds have been studied:

a. Specification MIL-G-13734A covers quaternary ammonium type germicides. It prohibits the use of certain chemicals potentially harmful to materials used in the construction of rubberized flight clothing. Compounds covered do not damage rubber and plastic nor readily cause dermatitis. Registration with the U. S. Department of Agriculture is required.

b. Interim Federal Specification P-D-00235 (GSA-FSS) covers detergent-sanitizers for general purposes. The material covered by this specification is essentially that of MIL-G-13734A mixed with a detergent. A storage stability requirement assures that there will be no loss of germicidal action or detergency. Although P-D-00235 is a performance specification, it also contains a requirement for a minimum active ingredient content. This requirement has been questioned by manufacturers since it eliminates the more efficient bactericides because of the cost, although their effectiveness would offset the price differential.

c. Federal Specification O-D-406 concerns a disinfectant, germicidal and fungicidal concentrate. It is designed for use after cleaning. Since, it does not restrict the chemical types of component materials there is a compatibility problem with soaps and detergents. In addition, some of the disinfectants seriously affect rubber and plastic materials.

III. EXPERIMENTAL PROCEDURES

A. Effects on Rubberized Fabrics

Specimens: (1) Mark IV Exposure Suit Fabric.

(2) Mark V Exposure Suit Fabric (including seams).

Immersion Media: (1) A two percent aqueous solution of a quaternary ammonium type bactericide.

(2) A two percent aqueous solution of a detergent-sanitizer.

Procedure: Duplicate specimens were immersed in each of the media for 60 seconds. One specimen was air-dried while the second was rinsed in water and allowed to air-dry. The specimens were visually examined for deterioration of the rubber and fabric and loss of adhesion at the seams.

B. Anti-Static Properties

Specimens: (1) Dacron swatches.

Anti-Static Agent: (1) MIL-C-18687A, Type II

Procedure: A swatch of Dacron was taped to a rigid plastic panel. The Dacron was vigorously rubbed with cotton flannel. The panel was held one half inch above cigarette ashes. The ashes were readily attracted to the Dacron. The Dacron was then sprayed with an aqueous solution of anti-static agent. the cloth was allowed to dry and again exposed to cigarette ashes. If no ashes were attracted, showing the charge to have been dissipated, the testing was continued as follows:

At 15 minute intervals the Dacron swatch was vigorously rubbed and again exposed to the ashes. After the fourth exposure, if the anti-static agent were still effective, the swatch was allowed to stand untouched for 24 hours. The swatch was then rubbed vigorously and again exposed to the ashes. If no ashes were attracted, the anti-static agent was considered effective.

C. Deodorizing Properties

Specimens: (1) Terry Cloth Toweling contaminated with perspiration.

Deodorizing Media: (1) A two percent aqueous solution of bactericide.

(2) A two percent aqueous solution of detergent-sanitizer.

Procedure:

- (1) Four pieces of toweling were dipped in a two percent solution of bactericide for five minutes. The specimens were removed and the excess liquid squeezed out. Two pieces were air-dried. The remaining two pieces were washed in a one-percent detergent solution, rinsed in distilled water and air-dried.
- (b) Four pieces of toweling were dipped in a two percent solution of detergent-sanitizer for five minutes. The specimens were removed and the excess liquid squeezed out. Two pieces were air dried. The remaining two pieces were rinsed in distilled water and air dried.
- (c) For control testing, two pieces of toweling were washed in a detergent solution and air dried. Two additional specimens were rinsed in distilled water and air dried.

IV. RESULTS

A. Rubber reinforced fabrics and seams used in Mark IV and Mark V exposure suits were not visibly affected by the bactericide and detergent-sanitizer tested.

B. Non-ionic detergents produced good anti-static films on Dacron. Although many other types of surface active agents may be used, these may not be compatible with various bactericides.

C. 1. Cloth dipped in bactericide and washed with a detergent solution was less odoriferous than cloth washed in detergent alone.

2. Cloth dipped in bactericide and air dried retained a slight odor, approximately the same as cloth washed in detergent solution and rinsed in distilled water.

3. The odor was removed from soiled toweling by dipping in a detergent-sanitizer. No difference in odor was detected between specimens not rinsed and those rinsed in distilled water before air drying.

4. Contaminated toweling that was air dried without any cleaning procedure retained an odor that was readily detectable when the cloth was slightly moistened. Rinsing the specimen with distilled water produced only a slight improvement.

V. CONCLUSIONS

As a result of this investigation it is concluded that:

A. Heavy rubberized flight clothing requires sanitizing for the well being of the maintenance personnel as well as for the comfort of the user.

B. Quaternary ammonium compounds are the most useful bactericidal agents for the purpose described.

C. Rubberized flight clothing can be sanitized and deodorized by immersing in a two percent aqueous solution of quaternary ammonium compound conforming to the requirements of Specification MIL-G-13734A. Bulky or insulated material that cannot be immersed must be sponged or sprayed with a two percent aqueous solution.

D. Washable materials may be cleaned and sanitized with an aqueous solution of a bactericide and a compatible detergent.

E. Materials treated with a sanitizer and not rinsed retain a residuum that retards bacterial growth and resultant odors.

F. Materials treated with a detergent-sanitizer mixture impart anti-static properties to the fabrics as well as sanitize.

G. Synthetic fabrics may be rendered anti-static with a dilute aqueous solution of detergent conforming to MIL-C-18687A, Type II by dipping, sponge wiping or spraying.

H. Since there is little need for the use of anti-static agents on the interior of pressure suits a spray application to the exterior should be sufficient.

I. MIL-C-18687A materials may be more useful without sanitizing additives since they present a stock identification problem.

VI. RECOMMENDATIONS

It is recommended that:

A. Compounds conforming to the requirements of MIL-G-13734A "Germicide, Quaternary Ammonium Type " be used for sanitizing and deodorizing rubberized flight clothing.

B. Mixtures of MIL-G-13734A germicides and non-ionic, biodegradable detergents conforming to MIL-C-18687A(WEP), Type II be used as detergent-sanitizers for cleaning and deodorizing rubberized flight clothing.

C. Synthetic materials such as nylon, Dacron, etc. be sponged, dipped into, or sprayed with a one percent solution of a detergent conforming to MIL-C-18687A, Type II to render them anti-static.

D. When dipping clothing containing zippers, the lubricant may be removed and means should be available for re-lubrication.

<p>U. S. NAVAL AIR ENGINEERING CENTER, PHILA., PA. AERONAUTICAL MATERIALS LABORATORY</p> <p>1. REPORT NO. NAEC-AML-2050 2. PAN 2-22</p> <p>Methods of Sanitizing and Deodorizing Rubberized Fabric and Producing Temporary Anti-Static Films on Synthetic Materials, by W. E. MacKenzie, October 1964, 8 pages</p> <p>An investigation of sanitizing, deodorizing, and anti-static agents is described. Recommendations are made for the use of quaternary ammonium compounds for sanitizing and deodorizing rubberized flight clothing and for the use of non-ionic detergents for rendering synthetic materials anti-static.</p>	<p>U. S. NAVAL AIR ENGINEERING CENTER, PHILA., PA. AERONAUTICAL MATERIALS LABORATORY</p> <p>1. REPORT NO. NAEC-AML-2050 2. PAN 2-22</p> <p>Methods of Sanitizing and Deodorizing Rubberized Fabric and Producing Temporary Anti-Static Films on Synthetic Materials, by W. E. MacKenzie, October 1964, 8 pages</p> <p>An investigation of sanitizing, deodorizing, and anti-static agents is described. Recommendations are made for the use of quaternary ammonium compounds for sanitizing and deodorizing rubberized flight clothing and for the use of non-ionic detergents for rendering synthetic materials anti-static.</p>
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