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THE HELMET PROTECTS THE AVIATOR'S HEAD--OR DOES IT,(U)
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(6) THE HELMET PROTECTS THE AVIATOR'S HEAD—OR DOES IT?

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ABSTRACT This paper examines the need for trained life support equipment specialists to maintain the protective capability of Army aviator's helmets (SPH-4). One-hundred helmets selected at random from the user population were evaluated for ability to attenuate impact forces, attenuate noise, and afford eye protection to the Army aviator. The evaluation revealed that protection was compromised in the majority of helmets in all three functional areas. The individual airman is responsible for maintaining his own equipment; no trained equipment personnel are available to inspect or maintain the helmets. The applicability of such a survey is suggested in the case of motorcycle and construction helmets.

INTRODUCTION Many commercial and military protective helmets provide protection against impact, noise, and fire. The Army aviator's protective helmet is an example of a highly functional protective helmet which also incorporates an effective sophisticated communications capability. The question of whether the helmet can/will be effectively maintained by the user in a normal work environment without specially trained supply and maintenance personnel was addressed; i.e., would maintenance by the user keep the helmet in a functional condition? The Army is in a unique position to evaluate this question in that it is the only uniformed service without trained organizational life support equipment personnel. Many helmets recovered from aircraft involved in accidents appeared to be inadequately maintained to the extent that they were nonfunctional. These observations led to the conclusion that helmets, which were not involved in accidents, should be evaluated.

SURVEY During a 6-month period, 100 helmets from aviators throughout the U.S. Army were randomly selected by the U.S. Army Aeromedical Research Laboratory (USAARL). USAARL has been studying aviation life support equipment for over 5 years and evaluating the extent to which the equipment protects the aviator at the time of accident compared to the design protection available at the time of manufacture. Most equipment at USAARL is studied after it has been retrieved from an accident; however, this survey allowed an evaluation of helmets in use prior to accidents. The helmet is primarily designed to protect the wearer's head. This evaluation addressed the areas of impact attenuation, hearing protection, and eye protection provided by the helmet.

Impact attenuation is accomplished by a hard outer shell which acts as a load distributor. A webbing suspension system is attached to the shell by screws. Between the shell and the suspension system is a styrofoam liner. Impact attenuation requires shell and suspension system integrity and adequate styrofoam. It presupposes a proper fit to the head of the aviator.

Hearing protection depends largely on an ear seal surrounding the ear. In order to accomplish an adequate seal, the vinyl material must be easily compressed to approximate the contours of the head. When this material hardens, an adequate

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seal is no longer possible, thus compromising ear protection and becoming uncomfortable to the wearer.

Eye protection is provided by an adjustable polycarbonate visor assembly which comes in clear and tinted versions. It is assumed that badly scratched and/or dirty visors have been left in the up position (not protecting the eyes) during flight as they would decrease visual acuity. Therefore, the condition of the visor was carefully inspected. The sample of 100 helmets included new and rebuilt helmets and some with over 5,000 flight hours.

The screws of the suspension/retention system were found to be loose and approximately 12 percent were missing. There were several examples of inappropriate substitution screws used in an effort to replace lost screws. Seventeen percent of the helmet shells were found to have fractures. Eight percent of chinstraps and 18 percent of nape straps were frayed. Almost all helmets (except the new ones) showed excessive compression and gouging of the styrofoam liner. Most of this trauma was attributable to carrying objects in the helmet, but several helmets were damaged from impact stressing (identified by the webbing marks engraved in the styrofoam). Twenty percent of the sytrofoam liners were further damaged by punctures and chemical damage, and three percent had portions of the liner missing. The retention system was compromised by torn out stitching in 36 percent of the helmets. These data indicating compromised impact attenuation are illustrated in figure 1. Ear seals were hardened beyond the point of effective noise attenuation in an alarming 69 percent of the sample.

Seventy-eight percent of the visors were of the tinted variety; 19 percent were of the clear type; two percent were an experimental yellow type, and one helmet had no visor. The large percentage of tinted visors leads to the speculation that visors are not being used during night flying. Seventy percent of the visors were scratched, 6 percent were cracked, and 31 percent were dirty enough to seriously impair vision. These data are illustrated in figure 2.

These findings appeared to correlate with information received from unit safety officers and accident investigation boards. Application of these findings to the entire Army aviation population would be reasonable extrapolation. The authors contend that the fielding of a sophisticated protective helmet without adequate maintenance personnel at the user level defeats the purpose for which the helmet was designed. It is suggested that a similar situation may exist in the civilian market in situations where the supervision and maintenance of protective equipment are largely left up to the user.

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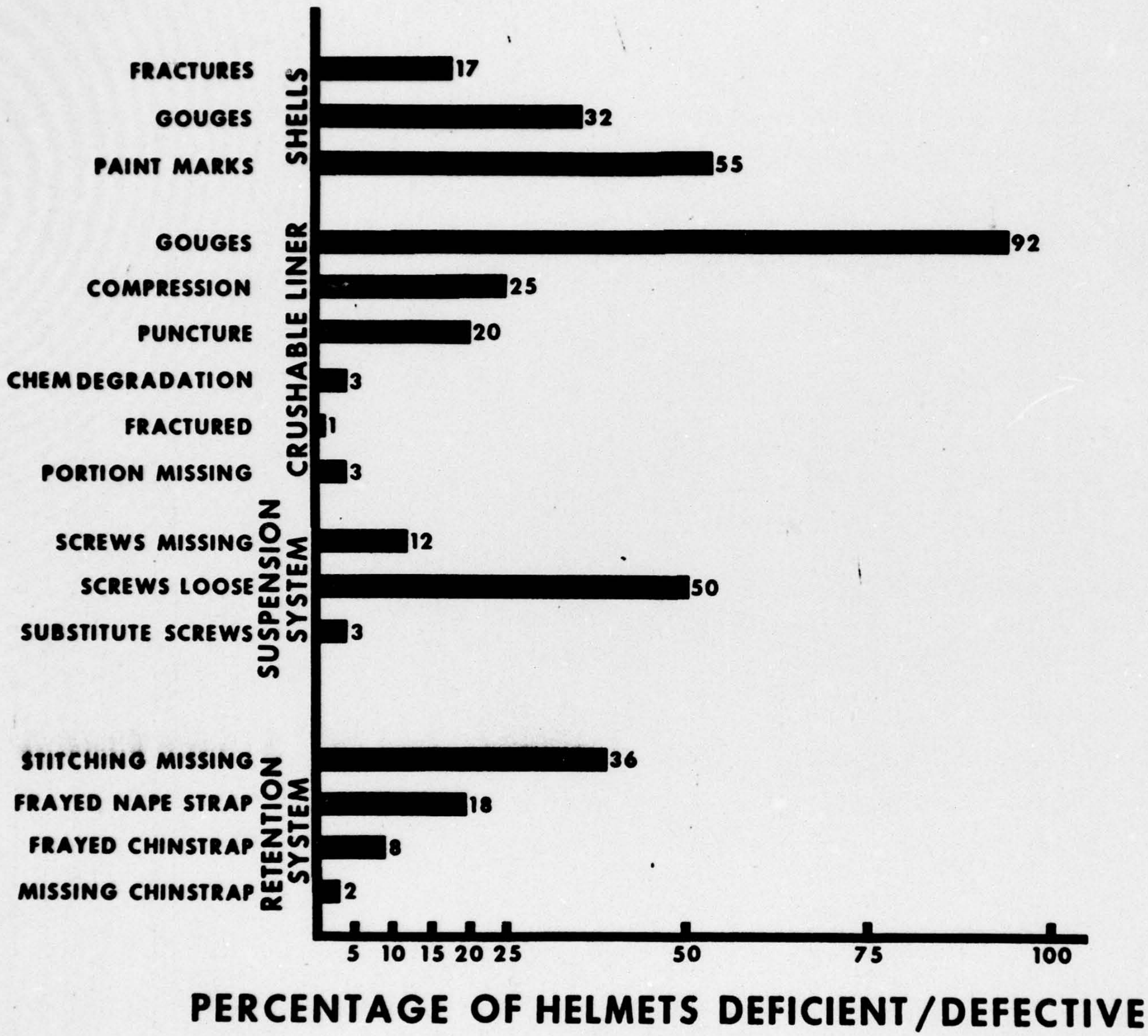

FIGURE 1. IMPACT ATTENUATION DEFICIENCIES.

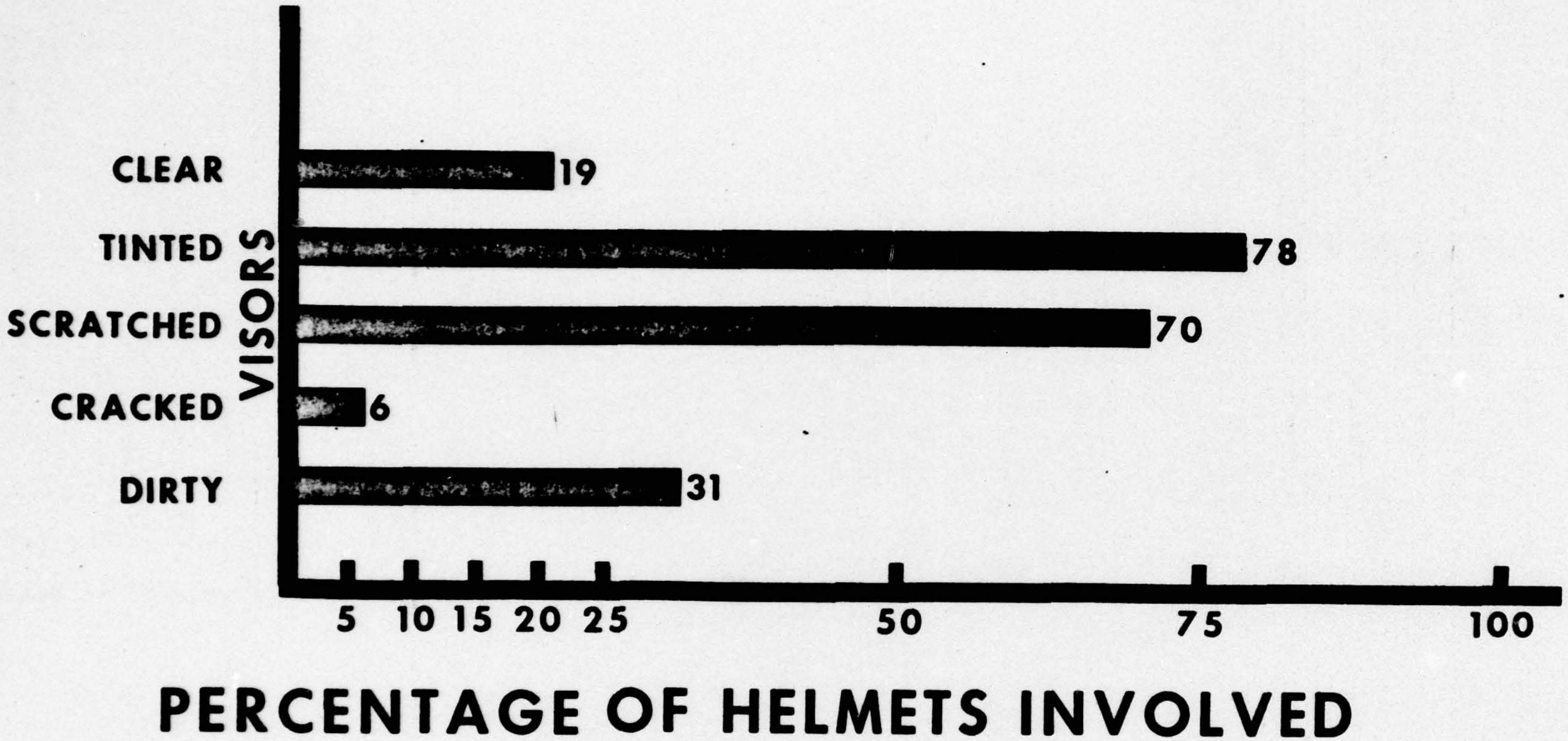

FIGURE 2. EYE PROTECTION DEFICIENCIES.