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ARCTIC AEROMEDICAL Laboratory

FIELD TEST OF THE BAG, CASUALTY, EVACUATION (EXPERIMENTAL)

PROJECT NUMBER 21-01-023

LADD AIR FORCE BASE
A L A S K A

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PROJECT NO. 21-01-023

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FEBRUARY 1950

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FIELD TEST OF THE BAG, CASUALTY, EVACUATION (EXPERIMENTAL)

INTRODUCTION

1. The Arctic Aeromedical Laboratory received the Bag, Casualty, Evacuation (Experimental) in May 1948 for testing and evaluation. Since it was impractical to conduct a field test at that time, a preliminary test was performed in a cold chamber. A field test was conducted during the 1948-49 winter test season by this laboratory. The results of these tests are contained in this report.

PURPOSE

1. To test the adequacy of the Bag, Casualty, Evacuation (Experimental) for use under extreme cold conditions, with special emphasis placed on the following:

a. Size of the casualty bag.
b. Weight and bulk.
c. Thermal insulation qualities.
d. Ease in opening and closing the casualty bag while administering medical aid to a casualty.
e. Ease of transporting a patient in the casualty bag.

DESCRIPTION OF THE BAG, CASUALTY, EVACUATION (EXPERIMENTAL)

1. Weight and bulk: The casualty bag weighs thirty-seven (37) pounds under normal conditions. The casualty bag is voluminous, but can be handled by one man when rolled.

2. Length and width: The casualty bag is eight (8) feet long and three (3) feet wide.

3. Outer repellant cover: Snaps to the outer layer of the casualty bag at the center and along both sides. Three longitudinal and three transverse straps and buckles are attached to the outer cover for handling purposes. Four straps and buckles are attached to the outer cover, two on each side, in order to secure the casualty bag to a litter. A fur ruff, incorporating a malleable wire, is sewed to the outer cover around face opening for face protection.

4. Canvas head protector: Zips to outer cover around head opening. Has twenty-one (21) small openings for respiratory exchange.

5. Outer layer: Consists of three sections; a bottom section, a right top, and a left top section. The right and left top sections are united by a central zipper. The two top sections are joined to the bottom section by two lateral margins. The bottom section has an attached foot pouch. There are four (4) central and two (2) lateral tabs on the zippers.

6. Inner quilt: Is divided into right and left pieces which snap to the right and left top sections of the outer layer respectively.

7. Inner protective liner: Also divided into right and left halves which snap to the right and left halves of the inner quilt.

8. Rubber sheet: Snaps to bottom section of outer layer at the lateral margins.

9. Rubber mattress: Snaps to the outer water repellant cover at the lateral margins.

METHOD OF TESTING

1. In testing the Bag, Casualty, Evacuation (Experimental), two tests were conducted. Test No. 1 was a controlled test in the cold chamber and Test No. 2 was a field test conducted under extreme cold conditions.

a. Test No. 1:

Four casualty bags were left in a cold chamber for sixteen (16) hours to insure complete cooling of the bags. At the end of this period of time, three inadequately clothed subjects and a medical observer entered the chamber where they remained for thirty minutes to reduce the heat reserve of each subject and the observer, thus simulating field conditions. After the thirty minute interval, each subject removed all clothing and entered a casualty bag. The subjects remained in the casualty bags for twenty-four (24) consecutive hours, during which time they were periodically questioned as to comfort and needs. All normal physiological functions such as eating, urinating, defecating, *etc.*, were carried out in the casualty bag. The medical observer collected pertinent data and used the fourth casualty bag intermittently. The temperature of the chamber was a minus three degrees F., plus or minus one degree F.

National Archives, College Park, MD
Review of 4 April 1996 and 8 May 1996

Record Group 341
Entry 44
Box 270

Folder: 21-01-023

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b. Test No. 2:

Seven casualty bags were taken to the test area near Ladd Air Force Base, Fairbanks, Alaska, 23 February 1949. Previously, the casualty bags had been cold soaked for several days to insure complete cooling of the casualty bags. At 0800, the test subjects entered the casualty bags, and remained for twenty-four (24) consecutive hours. The subjects were lying in the casualty bags on approximately eighteen (18) inches of snow. No protection or cover was provided. All normal physiological functions such as eating, urinating, defecating, *etc.*, were carried out in the casualty bags as in Test No. 1. The medical observer recorded data (see Appendix I) and made observations throughout the test period.

DISCUSSION

1. Weight: The casualty bag weighs thirty-seven (37) pounds under normal conditions. The weight of the casualty bag would be a disadvantage in some instances, such as ground parties traveling on foot carrying evacuation equipment in order to care for or evacuate casualties from a remote spot; or a light aircraft transporting evacuation equipment to the scene of the accident.

2. Bulk: The casualty bag is voluminous, but because of the outside straps it is easily handled by one person and is not unwieldly until opened. This is largely due to the absence of carrying straps along the sides of the casualty bag. The volume of the casualty bag, like its weight, will often be disadvantageous for the same reasons.

3. Length and width: The casualty bag is eight (8) feet long and three (3) feet wide, which is sufficient length and width to protect adequately a large man dressed in arctic clothing who has a Thomas leg splint applied to both legs and both arms splinted by use of the wire ladder splint. This is an excellent feature, and one which deserves to be retained in any casualty bag. However, during the twenty-four (24) hour cold chamber test, the casualty bag was found to be too long for the shortest subject (height 5' 5") and he complained almost immediately of cold feet. After the length of the casualty bag was reduced, the subject soon became comfortable and remained so throughout the test period. The subject of average height stated that his feet were cold, but not uncomfortable, during the first two hours. His feet became uncomfortabl cold during the third hour and it was necessar to shorten his casualty bag. After the casualt bag was shortened, this subject also remaine comfortable throughout the test. The largest ma (height 6' 2", weight 200 pounds) was comfort able throughout the twenty-four (24) hour period

The casualty bag was shortened by foldin the excess at the bottom, under the patient' feet and legs. This eliminated dead air space.

4. Insulation: The casualty bag was sufficient ly insulated from the standpoint of patient pro tection, under all temperatures and condition encountered in the test. Several subjects state that their feet became uncomfortably cold. Thi was contributed to the large volume of air whic had to be heated in the lower portion of th casualty bag.

5. Closures:

a. The snaps, because the male and femal counterparts fit snugly, are difficult to manipu late when the hands are bare and cold, but ar more difficult to open or close with gloved hands Under normal room temperatures no difficultie were encountered in operating the snaps. Durin the period of testing, the snaps pulled out of th material on four of the casualty bags. This le large gaps between the water repellant cover an the outer layer which quickly filled with snow It was also observed that snow worked in unde the water repellant cover between the snaps which caused the outer layer to become wate soaked when brought into a heated shelter. Whe the female counterpart of the snaps fill wit snow, the snaps became inoperative. There i an extremely large number of snaps used in th make-up of the casualty bag. Several subject complained that they always seemed to be lyin on a snap, regardless of the position the assumed.

b. Zippers: The subjects and the observe found that the center zipper and stay tapes wer in direct contact with the casualty's body. Di ficulty was encountered in reaching the latera zipper track, because the outer repellant cove had to be unsnapped in order to reach the zippe and adjust the stay tapes. The zipper and num ber of stay tapes were placed, and functione satisfactorily. A technician was able to chec or administer first aid to any part of the casua ty's body, without undue exposure. The subject were capable of extricating themselves from th casualty bag easily and quickly.

National Archives, College Park, MD
Review of 4 April 1996 and 8 May 1996

Record Group 341
Entry 44
Box 270

Folder: 21-01-023

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Authority NND 813015
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6. Canvas head protector: The canvas head protector was used by all subjects throughout the second test. The head protector was liked by all. The subjects had no fear at any time of claustrophobia. Frosting was plainly visible inside the canvas head protector of all casualty bags. Moisture was present on the fur ruff of each casualty bag and had a tendency to keep the patient's face damp. This added to patient discomfort. The fur ruff serves no purpose and could easily be removed when a canvas head protector is used. The canvas head protector affords excellent face protection for casualties being evacuated by sled or toboggan.

7. Sponge mattress: Each casualty bag was examined after each test for evidence of matting of the materials. The sponge mattress tended to mat beneath the shoulders and hips where most of the body weight was balanced. Extreme and rapid temperature change is known to occur periodically throughout all of Alaska. If the casualty bag was exposed to moisture during an extreme temperature change or during the spring thaw, the sponge mattress could be expected to absorb large quantities of water, and the weight of the casualty bag would be increased. The substitution of an air mattress would reduce the weight of the casualty bag, increase the patient's comfort, and avoid water soaking.

8. Rubberized sheet: The rubberized sheet was removed by all test subjects during both tests because of the very rapid conduction of heat from the body. A waterproof sheet would be desirable under certain circumstances, such as during the evacuation of incontinent patients or casualties with massive or multiple wounds. The use of a waterproof sheet would extend the period of serviceability of the casualty bag by preventing excessive soiling, which aids in the breakdown of the insulating qualities.

9. Transportation of casualties: The casualty bag was observed under all available methods of evacuation; hand carry, litter, sled, toboggan, Snowmobile, M-29-C Cargo Carrier (Weasel) and ambulance. During these observations, the following was noted:

a. It was very difficult to lift or carry a patient who was in the casualty bag due to the lack of carrying straps.

b. The litter straps attached to the bottom of the water repellant cover for the purpose of securing the casualty bag to a litter were easily torn loose. This was largely due to the lightweight material used in making the outer repellant cover to which the litter straps were attached.

c. No method was determined to immobilize a Thomas leg splint when applied to a casualty being evacuated in a bag, casualty evacuation. The splinted legs moved around considerably and responded to every jar during evacuation. A slit in the bottom section of the casualty bag at the point of the patient's left and right heel, large enough for the splint rest to slip through and anchor to the sled or litter was tried. This presented another problem; as the height of the patients varied, the position of the foot rest varied, requiring that the slit be relocated for each patient.

CONCLUSIONS

1. In conclusion, the Bag, Casualty, Evacuation (Experimental) can be considered unsatisfactory for the following reasons:

a. The casualty bag, when occupied by a patient, is difficult to handle due to the lack of carrying straps.

b. The litter straps were easily torn loose from the casualty bag.

c. The zippers and snaps operate satisfactorily, but are difficult to operate under extreme cold conditions.

d. The sponge mattress tends to mat beneath the shoulders and hips. The sponge mattress could be expected to absorb large quantities of water.

e. The rubberized sheet was unsatisfactory due to rapid conduction of heat from the body.

f. No provision has been made for immobilization of a Thomas splint, when applied to a casualty being evacuated in a Bag, Casualty, Evacuation (Experimental).

2. The Bag, Casualty, Evacuation (Experimental) can be considered satisfactory for the following reasons:

a. The Bag, Casualty, Evacuation (Experimental) is of sufficient length and width.

b. The thermal insulation qualities are adequate.

c. The canvas head protector affords excellent face protection for casualties being evacuated by sled or toboggan.

RECOMMENDATION

1. Recommend that the development phase of the Bag, Casualty, Evacuation (Experimental) project be continued.

National Archives, College Park, MD
Review of 4 April 1996 and 8 May 1996

Record Group 341
Entry 44
Box 270

Folder: 21-01-023

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APPENDIX I
All Temperatures Are In Centigrade

CASUALTY BAG NO.	0930	1030	1130	1430	1730	1930	2130	2230	2330	0700
1. *Back	26	28	30	29	28	31	30	30	30	28
**Foot	20	18	21	20	22	23	25	25	23	22
2. Back	24	22	24	27	26	28	25	28	26	24
Foot	18	17	18	18	19		19	19	19	18
3. Back	22	23	24	25	25	27	27	26	24	25
Foot	18	19	20	19	20	21	21	20	19	19
4. Back	31	32	32	29	29	31	31	30	31	27
Foot	22	26	25	24	21	22	20	19	20	18
5. Back	22	25	24	25	24	25	27	23	25	23
Foot	18	18	16	18	18	19	20	20	19	18
6. Back	22	26	22	23	24	25	27	22	25	23
Foot	18	18	19	19	18	20	21	21	20	19
7. Back	29	28	30	30	29	30	27	28	25	30
Foot	20	21	23	23	30	22	21	20	20	21
Free Air Temperature	-23	-23	-21	-18	-22	-23	-25	-26	-26	-27
Sky Condition	5/10 Broken Clouds	4/10 Broken Clouds	Cl.	3/10 Broken Clouds	Dark	Dark	Dark	Dark	Dark	Dark
Wind Velocity in MPH	2	3	1	0	2	4	2	6	5	5

* Thermocouple reading taken from the inside center of bag next to patient.
** Thermocouple reading taken from the inside of bag near feet of patient.

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APPENDIX II

Bag, Casualty, Evacuation (Experimental) with patient inside and face protector in place.

Bag, Casualty, Evacuation (Experimental) illustrating casualty position when the Thomas leg splint is applied.

National Archives, College Park, MD
Review of 4 April 1996 and 8 May 1996

Record Group 341
Entry 44
Box 270

Folder: 21-01-023

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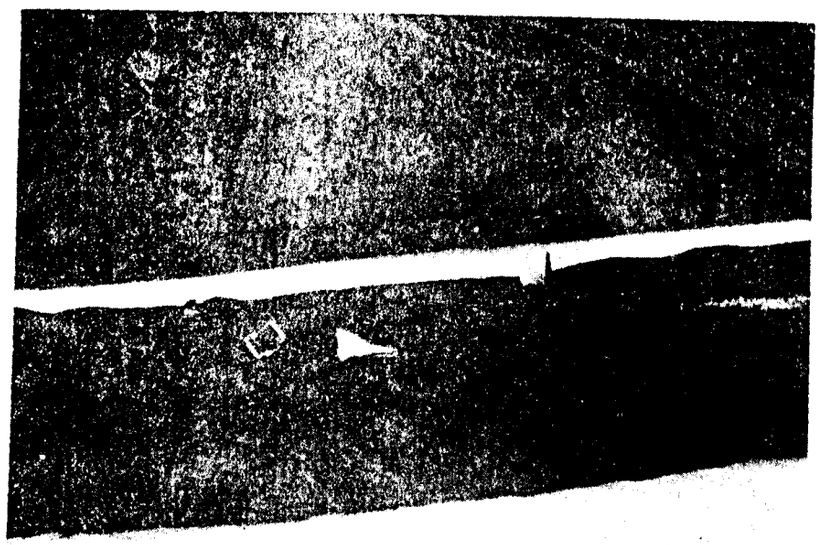

The outer repellant cover illustrating the torn litter strap and pulled out straps.

National Archives, College Park, MD
Review of 4 April 1996 and 8 May 1996

Record Group 341
Entry 44
Box 270

Folder: 21-01-023

National Archives, College Park, MD
Review of 4 April 1996 and 8 May 1996

Record Group 341
Entry 44
Box 270

Folder: 21-01-023