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Report 5

**MEDICAL DATA SUMMARIES OF EVENTS OCCURRING
IN THE SPRING 1960 USA-CDEC FIELD EXPERIMENT**

Prepared for:

COMBAT DEVELOPMENT GROUP
U.S. MEDICAL SERVICE
BROOKE ARMY MEDICAL CENTER
FORT SAM HOUSTON, TEXAS

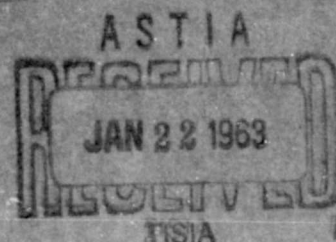
CONTRACT DA-49-193-MD-2169

By: Marilyn Anderson Paul Brock George W. Evans II

STANFORD RESEARCH INSTITUTE

MENLO PARK, CALIFORNIA

*SRI





June 1962

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By: Marilyn Anderson Paul Brock George W. Evans II

SRI Project No. 3694

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ABSTRACT

The purpose of SRI Project 3694 (Contract DA 49-193 MD-2169) is to summarize and analyze data collected in two medical field experiments performed at the United States Army Combat Development Experimentation Center, Fort Ord, California. This report presents statistical summaries of the casualty data collected during the Spring 1960 field experiment and listed in Report 3 of this project.

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MEDICAL DATA SUMMARIES OF EVENTS OCCURRING
IN THE SPRING 1960 USA-CDEC FIELD EXPERIMENT

I INTRODUCTION

The medical experiment conducted at CDEC during the Spring of 1960 was a pure experiment. Only medical units and casualties were simulated by line troops engaged in realistic operations. During the course of the experiment 1069 casualties were generated. The casualties were generated at nine different rates, ranging from four per hour to 80 per hour. The casualties were subdivided into 75 types. The experiments were conducted over three types of terrain.

The experimental actions began with a notification by radio to a message center that a casualty was located at a given geographical position. Ambulances were dispatched for each casualty upon receipt of the notification message. A certain amount of field treatment was administered by the aid men assigned to the ambulances. These aid men then loaded the casualties into ambulances for evacuation through the medical system.

Evacuation by ambulance was provided to the ICG aid station, either directly or via the company collecting post. Removal from the aid station was accomplished by helicopter to the division air strip or by ambulance to the division field hospital. The evacuation paths that were used are schematically shown in Fig. 1 of Report 3.^{1*}

The current report presents consolidated statistical information that was developed from the raw data detailed in Report 3. These statistics are presented primarily for the purpose of "examining the capabilities and limitation" of the Combat Group medical support function, particularly "in the functional areas of triage, treatment, and evacuation of personnel casualties."²

*References are listed at the end of this report.

The Tegtmeier letter (see Appendix of Report 1³) requests information from the experiment in much more specific terms than do the general directives. The extent of specific areas for investigation that are proposed in the letter is excessive. Furthermore, the experiment does not appear to have been geared to many of these requests. In preparing the statistics that are contained in this report, deliberation was given to the writings of Colonel Tegtmeier. A more extensive discussion on this point is contained in the final report of the project.

Several comments that were made in prior reports bear repetition here. First, the term "to examine," used in the objectives of the experiments, is vague, leaving a wide degree of latitude to the statistical analyst to select information and prepare his breakdowns. There are a number of conditions that must be determined subjectively, that include:

- (1) A reasonable limit of presented detail
- (2) Appropriateness and significance of the selected information
- (3) Estimates of the reliability of the data
- (4) Estimates of the value of the presented procedures for subsequent application (training phase).

Second, results and references, though relating to the events of the experiment, in fact only relate to the data as reported. The data itself, being subject to errors of transcription, omissions, biases, and other distortions, presents a picture that differs from reality.

The statistical breakdowns that are presented in this report are divided into four sections. "Administrative" concerns information on the operations necessary, but preliminary, to medical assistance reaching the casualty on the field. Section III, "Removal Activities" deals with the questions of casualty transport through the medical system. This is followed by "Medical Workloads," an analysis of the buildup of casualties through the medical system and the efficiency and dispatch with which the casualties are treated. The final section, "Medical Performance," is concerned with the effectiveness on the casualties of the medical treatment throughout the system.

II ADMINISTRATIVE

Figure 2-1 indicates the processing of a casualty as a time sequence of operations. Not all the operations occurred in all cases (see Fig. 1 of Ref. 1). That part of the processing indicated on the top line of Fig. 2-1 herein is examined in this section.

The distribution of message acknowledgment time differences from the start of the experiment (H-hour) is a measure of the message center activity. The distribution of time differences between acknowledgment time and notification time presents a measure of the transmission times of messages through the communication nets.

Frequency tables for both of these distributions are presented in Table 2-2 and Table 2-3, respectively. These tables are plotted in Fig. 2-2 and Fig. 2-3.

With the tabulated information are included standard statistical functions, i.e., the sample size, minimum and maximum values indicating the range of the distribution and the average value of the range variable. As measures of the dispersion of the distribution, both the standard deviation and variance are presented, as calculated. The frequency charts are in the form of piece-wise linear graphs having point separation equal to the range interval of the table to which they refer. The value at each end point represents the totality of events throughout the adjacent but preceding time interval.

During the course of the experiments, casualties were generated at varying rates, as per Table 2-1. To determine the effect of rate of casualty generation on the medical system, the statistical breakdowns were calculated for a low rate of 20 per hour and for the highest rate of 80 per hour. For these value choices, consideration was given to the sample sizes that were involved. These particular breakdowns are contrasted with the corresponding data for all casualties emanating from the experiments. Except where noted, these three breakdowns are standard for the statistical analyses presented in this report. They are denoted by a, b, c, subdesignations for each references table or figure.

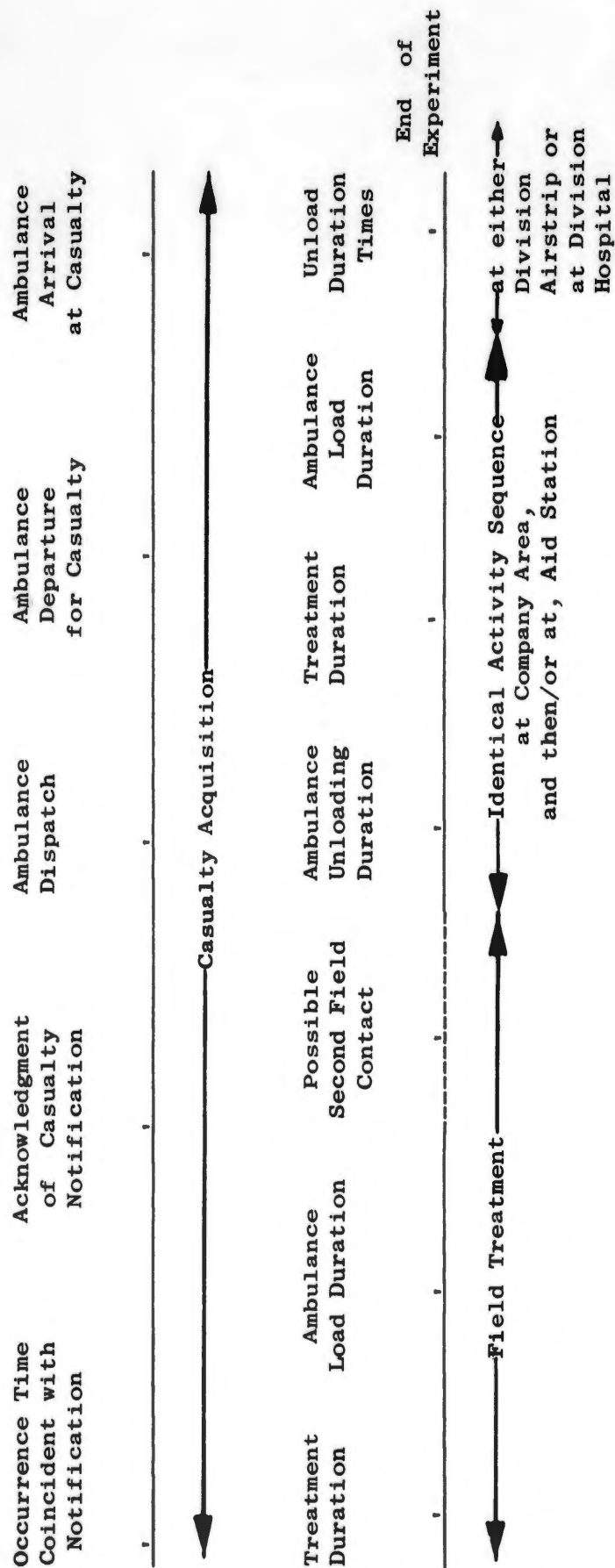


Figure 2-1: Representation of Time Sequencing of Field Experiment

Table 2-1
SIGNIFICANT PARAMETERS INVOLVED IN THE SPRING 1960 FIELD EXPERIMENT

Casualty Rate Per Hour	Frequency	No. of Hours Per Experiment	No. of Experiments	No. of Field Ambulances
4	40	4	2	6
6-2/3	40	3	2	6
10	100	5	2	6
16	160	5	2	6,7
16-2/3	150	3	3	6,7
20	220	1	11	2,5,6
26-2/3	160	3	2	7
50	50	1	1	6
80	160	1	2	6

FIG. 2-2 FREQUENCY DISTRIBUTIONS - MESSAGE CENTER ACTIVITY

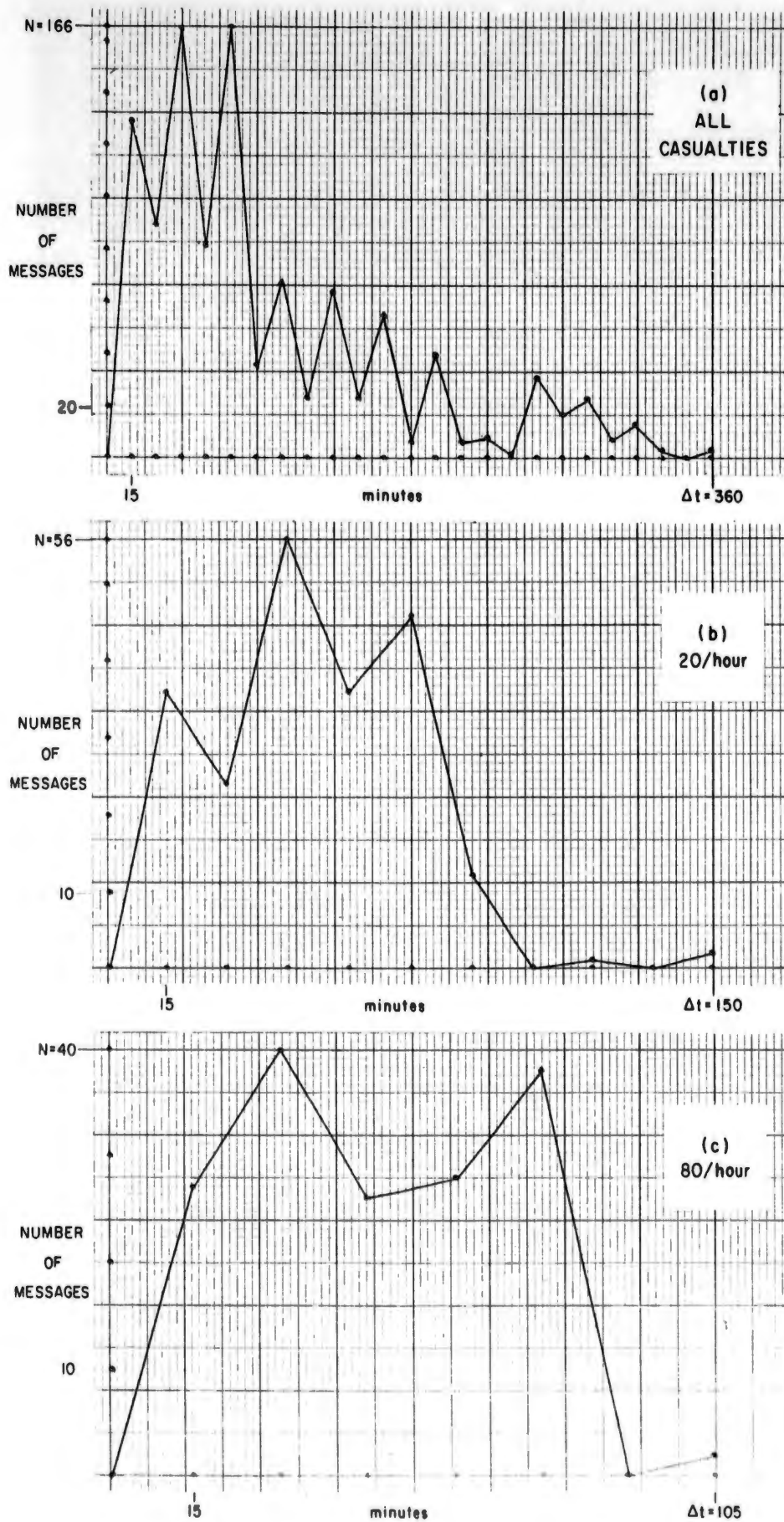


TABLE 2-2
FREQUENCY DISTRIBUTIONS - MESSAGE CENTER ACTIVITY

(a)							(b)							(c)						
Δt FROM H HOUR ALL CASUALTIES							Δt FROM H HOUR 20/hour DISTRIBUTION							Δt FROM H HOUR 80/hour DISTRIBUTION						
TOTAL NO. SAMPLES	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	TOTAL NO. SAMPLES	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	TOTAL NO. SAMPLES	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.
1063	1055	0000	0347	86.80	5958	77.19	0212	0212	0000	0148	40.85	624.8	24.95	0161	0161	0000	0092	37.47	456.9	21.37
FREQ. DISTRIB.							FREQ. DISTRIB.							FREQ. DISTRIB.						
DELTA TIME INTERVAL (MINS)		NO. OF MESSAGES					DELTA TIME INTERVAL (MINS)		NO. OF MESSAGES					DELTA TIME INTERVAL (MINS)		NO. OF MESSAGES				
000-015		0129					000-015		0036					000-015		0027				
015-030		0089					015-030		0024					015-030		0040				
030-045		0165					030-045		0056					030-045		0026				
045-060		0081					045-060		0036					045-060		0028				
060-075		0166					060-075		0046					060-075		0038				
075-090		0035					075-090		0012					075-090		0000				
090-105		0067					090-105		0000					090-105		0002				
105-120		0023					105-120		0001											
120-135		0064					120-135		0000											
135-150		0023					135-150		0002											
150-165		0053																		
165-180		0006																		
180-195		0040																		
195-210		0006																		
210-225		0008																		
225-240		0001																		
240-255		0031																		
255-270		0017																		
270-285		0023																		
285-300		0007																		
300-315		0013																		
315-330		0003																		
330-345		0000																		
345-360		0003																		

FIG. 2-3 FREQUENCY DISTRIBUTIONS - MESSAGE TRANSMISSION TIME

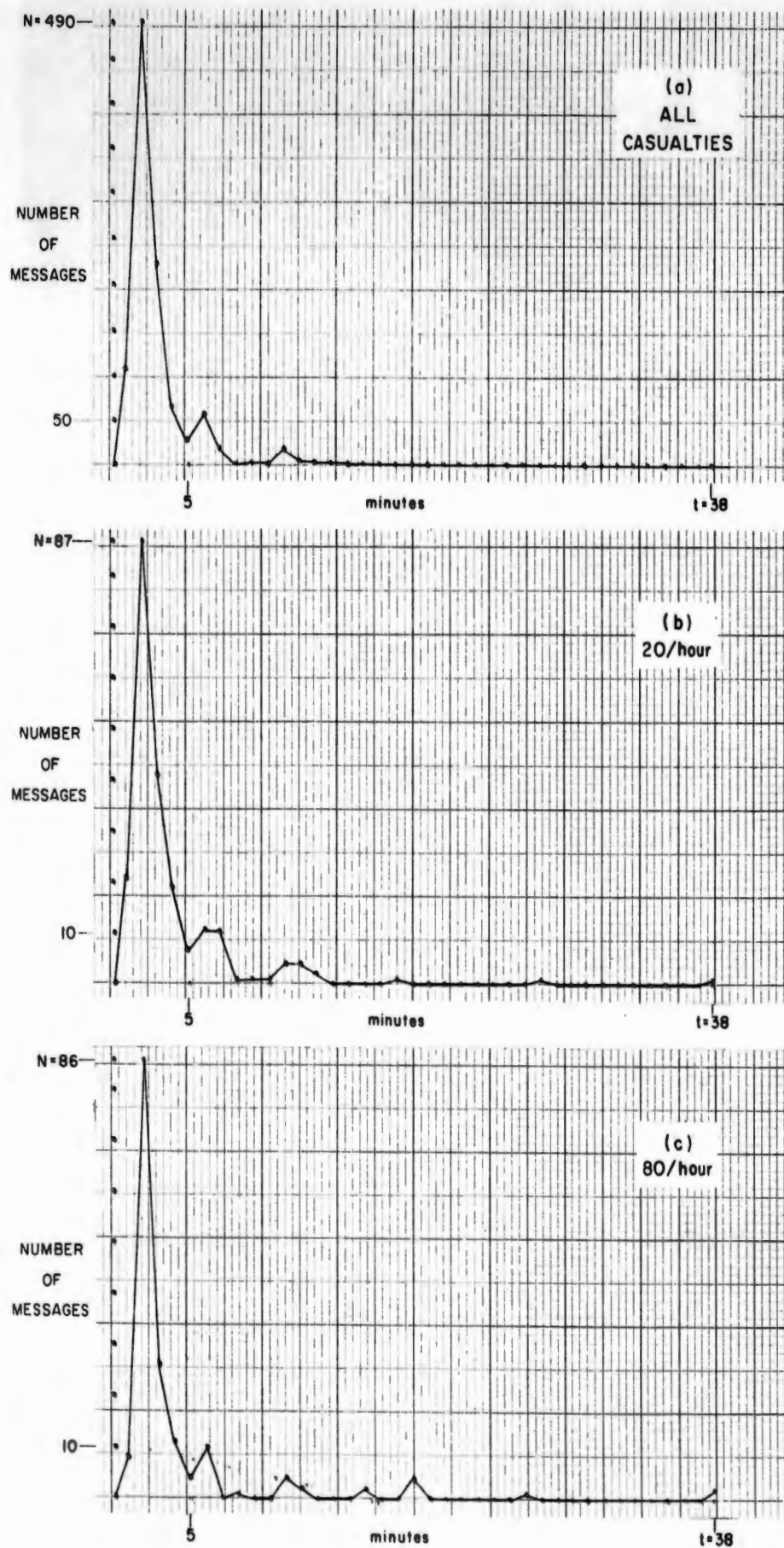


TABLE 2-3

FREQUENCY DISTRIBUTIONS - MESSAGE TRANSMISSION TIME

(a) Δt FROM H HOUR ALL CASUALTIES								(b) Δt FROM H HOUR 20/hour DISTRIBUTION								(c) Δt FROM H HOUR 80/hour DISTRIBUTION							
TOTAL NO. SAMPLES	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.		TOTAL NO. SAMPLES	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.		TOTAL NO. SAMPLES	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	
1063	1059	0000	0188	2.650	51.45	7.179		0212	0212	0000	0037	2.740	19.52	3.940		0161	0161	0000	0037	3.149	30.04	5.480	
FREQ. DISTRIB.								FREQ. DISTRIB.								FREQ. DISTRIB.							
DELTA TIME INTERVAL (MINS)		NO. OF MESSAGES		DELTA TIME INTERVAL (MINS)		NO. OF MESSAGES		DELTA TIME INTERVAL (MINS)		NO. OF MESSAGES		DELTA TIME INTERVAL (MINS)		NO. OF MESSAGES		DELTA TIME INTERVAL (MINS)		NO. OF MESSAGES		DELTA TIME INTERVAL (MINS)		NO. OF MESSAGES	
000-001		0107		000-001		0021		000-001		0008		000-001		0008		000-001		0008		000-001		0008	
001-002		0490		001-002		0087		001-002		0086		001-002		0086		001-002		0086		001-002		0086	
002-003		0223		002-003		0041		002-003		0026		002-003		0026		002-003		0026		002-003		0026	
003-004		0065		003-004		0019		003-004		0011		003-004		0011		003-004		0011		003-004		0011	
004-005		0028		004-005		0007		004-005		0004		004-005		0004		004-005		0004		004-005		0004	
005-006		0059		005-006		0011		005-006		0010		005-006		0010		005-006		0010		005-006		0010	
006-007		0019		006-007		0010		006-007		0001		006-007		0000		006-007		0000		006-007		0000	
007-008		0003		007-008		0001		007-008		0001		007-008		0001		007-008		0001		007-008		0001	
008-009		0007		008-009		0001		008-009		0001		008-009		0001		008-009		0000		008-009		0000	
009-010		0001		009-010		0001		009-010		0001		009-010		0000		009-010		0000		009-010		0000	
010-011		0019		010-011		0004		010-011		0004		010-011		0004		010-011		0004		010-011		0004	
011-012		0007		011-012		0004		011-012		0002		011-012		0002		011-012		0002		011-012		0002	
012-013		0002		012-013		0002		012-013		0000		012-013		0000		012-013		0000		012-013		0000	
013-014		0001		013-014		0000		013-014		0000		013-014		0000		013-014		0000		013-014		0000	
014-015		0001		014-015		0000		014-015		0000		014-015		0000		014-015		0000		014-015		0000	
015-016		0005		015-016		0000		015-016		0000		015-016		0000		015-016		0002		015-016		0002	
016-017		0000		016-017		0000		016-017		0000		016-017		0000		016-017		0000		016-017		0000	
017-018		0001		017-018		0001		017-018		0001		017-018		0000		017-018		0000		017-018		0000	
018-019		0004		018-019		0000		018-019		0000		018-019		0000		018-019		0004		018-019		0004	
019-020		0000		019-020		0000		019-020		0000		019-020		0000		019-020		0000		019-020		0000	
020-021		0003		020-021		0000		020-021		0000		020-021		0000		020-021		0000		020-021		0000	
021-022		0000		021-022		0000		021-022		0000		021-022		0000		021-022		0000		021-022		0000	
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023-024		0001		023-024		0000		023-024		0000		023-024		0000		023-024		0000		023-024		0000	
024-025		0000		024-025		0000		024-025		0000		024-025		0000		024-025		0000		024-025		0000	
025-026		0001		025-026		0000		025-026		0000		025-026		0000		025-026		0001		025-026		0001	
026-027		0001		026-027		0001		026-027		0001		026-027		0000		026-027		0000		026-027		0000	
027-028		0000		027-028		0000		027-028		0000		027-028		0000		027-028		0000		027-028		0000	
028-029		0003		028-029		0000		028-029		0000		028-029		0000		028-029		0000		028-029		0000	
029-030		0000		029-030		0000		029-030		0000		029-030		0000		029-030		0000		029-030		0000	
030-031		0001		030-031		0000		030-031		0000		030-031		0000		030-031		0000		030-031		0000	
031-032		0001		031-032		0000		031-032		0000		031-032		0000		031-032		0000		031-032		0000	
032-033		0000		032-033		0000		032-033		0000		032-033		0000		032-033		0000		032-033		0000	
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034-035		0000		034-035		0000		034-035		0000		034-035		0000		034-035		0000		034-035		0000	
035-036		0000		035-036		0000		035-036		0000		035-036		0000		035-036		0000		035-036		0000	
036-037		0000		036-037		0000		036-037		0000		036-037		0000		036-037		0000		036-037		0000	
037-038		0001		037-038		0001		037-038		0001		037-038		0001		037-038		0002		037-038		0002	

The difference between the time of ambulance dispatch and time of acknowledgment of the casualty notification message, is tabulated in Table 2-4 and graphed in Fig. 2-4. This information is presented with the same formats as the two preceding tables and figures. The delay here stems from the procedure that ambulances are dispatched only when they are free; that is, when they have reached their previous dispatch mission. Hence, this frequency breakdown gives an indication of the queueing characteristics of extensive casualty occurrences with limited ambulance capabilities. The casualty distribution rates are noted above, in Table 2-1, as are the number of participating ambulances for field pick-up.

Upon being dispatched, the actual departure time of the ambulance and mileage were recorded. The time differences between dispatch and departure was generally small. The minimum recorded difference was 0, and although the maximum recorded difference was 330 minutes, the average recorded difference was only 4.3 minutes, showing the strong skew to the left. For the entire distribution, only 17.1% of the cases were delayed in excess of 3 minutes.

The normal procedure is to travel to the casualty immediately. Since the time of arrival and ambulance mileage at arrival were recorded, a rate figure can be computed:

$$\text{ambulance rate} = \frac{60 \times (\text{mileage upon arrival at casualty} - \text{mileage at departure})}{\text{time of arrival at casualty} - \text{time of departure}} \quad (1)$$

(m.p.h.)

This statistic may be very misleading for several reasons. First, the denominator of the right-hand side of Eq. (1) may be zero or negative. Aside from the possibilities of recording errors, such values may be legitimate if the ambulance is at the casualty, or if its crew had noted and attended the casualty prior to receiving the dispatch message. Of 1069 casualties, the incidence of such recorded data is as follows:

Time of arrival at casualty coincident with departure time: 12 cases.

Time of arrival preceding departure time: 40 cases.

FIG. 2-4 FREQUENCY DISTRIBUTIONS – AMBULANCE DISPATCH DELAYS

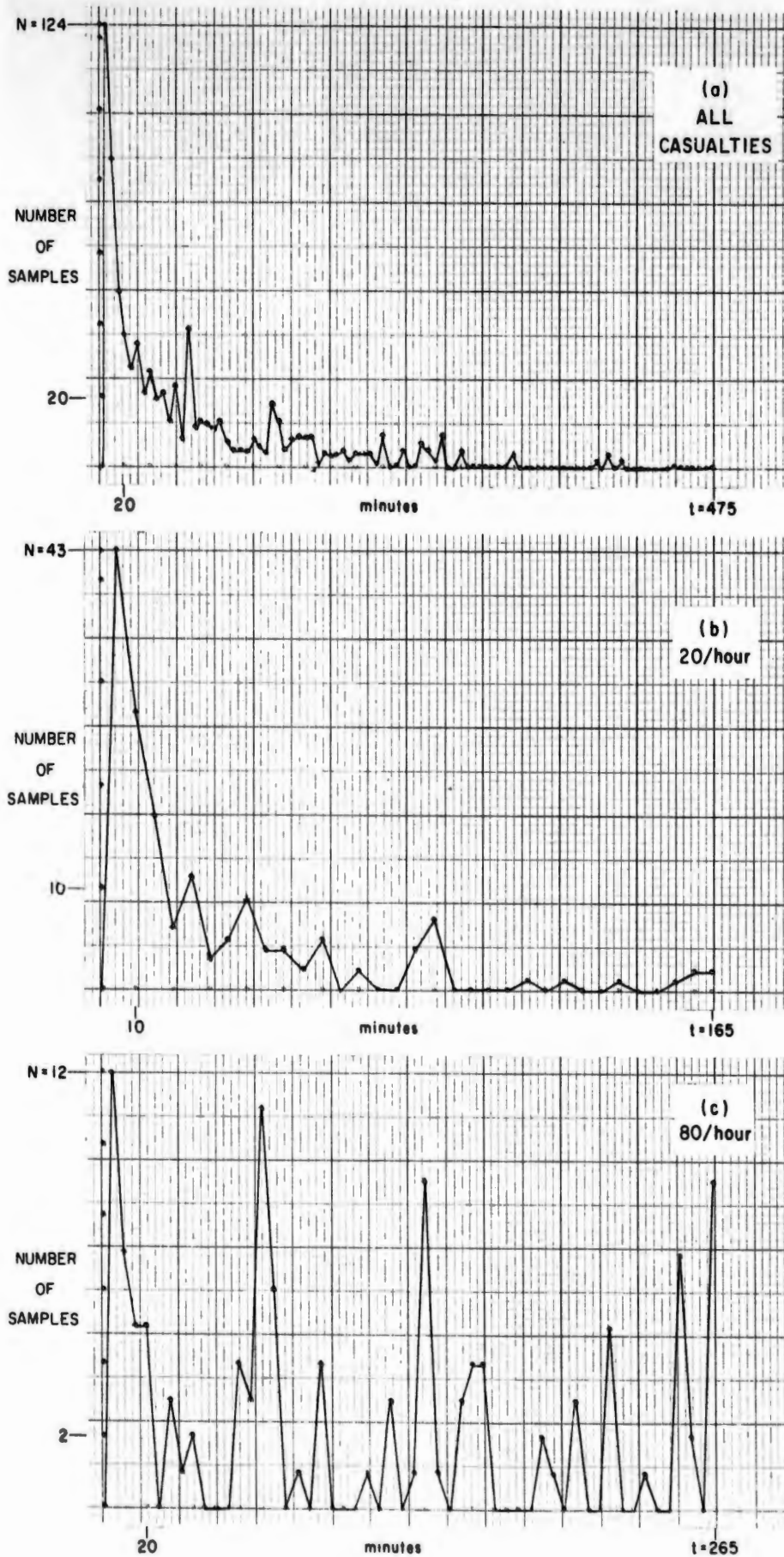


TABLE 2-4

FREQUENCY DISTRIBUTIONS - AMBULANCE DISPATCH DELAYS

(a)										(b)										(c)									
Δt FROM H HOUR ALL CASUALTIES										Δt FROM H HOUR 20/hour DISTRIBUTION										Δt FROM H HOUR 80/hour DISTRIBUTION									
TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.				TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.				NO. CAS.	VALID SAMPLE	DELTA TIME	DELTA TIME	DELTA TIME	VAR.	DEV.			
1069	0790	0000	0472	68.49	4541	80.07				0218	0157	0000	0164	27.70	1319	36.32				0120	0120	0000	0264	110.2	7766	88.17			
FREQ. DISTRIB.										FREQ. DISTRIB.										FREQ. DISTRIB.									
DELTA TIME INTERVAL (MINS)		NO. OF CAS.								DELTA TIME INTERVAL (MINS)		NO. OF CAS.								DELTA TIME INTERVAL (MINS)		NO. OF CAS.							
000-005		0124								000-005		0043								000-005		0012							
005-010		0086								005-010		0027								005-010		0007							
010-015		0049								010-015		0017								010-015		0005							
015-020		0037								015-020		0006								015-020		0003							
020-025		0028								020-025		0011								020-025		0000							
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125-130		0004								125-130		0000								135-140		0009							
130-135		0018								130-135		0000								140-145		0001							
135-140		0013								135-140		0001								145-150		0000							
140-145		0005								140-145		0000								150-155		0003							
145-150		0008								145-150		0000								155-160		0004							
150-155		0009								150-155		0000								160-165		0004							
155-160		0008								155-160		0000								165-170		0000							
160-165		0009								160-165		0000								170-175		0004							
165-170		0001								165-170		0000								175-180		0003							
170-175		0004								170-175		0000								180-185		0004							
175-180		0003								175-180		0000								185-190		0005							
180-185		0004								180-185		0000								190-195		0002							
185-190		0005								185-190		0000								195-200		0004							
190-195		0002								190-195		0000								200-205		0004							
195-200		0004								195-200		0000								205-210		0000							
200-205		0004								200-205		0000								210-215		0000							
205-210		0004								205-210		0000								215-220		0000							
210-215		0001								210-215		0000								220-225		0000							
215-220		0009								215-220		0000								225-230		0001							
220-225		0000								220-225		0000								230-235		0005							
225-230		0001								225-230		0000								235-240		0000							
230-235		0005								230-235		0000								240-245		0001							
235-240		0000								235-240		0000								245-250		0007							
240-245		0001								240-245		0000								250-255		0005							
245-250		0007								245-250		0000								255-260		0002							
250-255		0005								250-255		0000								260-265		0009							
255-260		0002								255-260		0000								265-270		0000							
260-265		0009								260-265		0000								270-275		0000							
265-270		0000								265-270		0000								275-280		0005							
270-275		0000								270-275		0000								280-285		0000							
275-280		0005								275-280		0000								285-290		0001							
280-285		0000								280-285		0000								290-295		0000							
285-290		0001								285-290		0000								295-300		0000							
290-295		0000								290-295		0000								300-305		0000							
295-300		0000								295-300		0000								305-310		0000							
300-305		0000								300-305		0000								310-315		0000							
305-310		0000								305-310		0000								315-320		0004							
310-315		0000								310-315		0000								320-325		0000							
315-320		0004								315-320		0000								325-330		0000							
32																													

According to the experimental S.O.P., recorded time information is to the nearest minute [hence the factor, 60, in Eq. (1)] and recorded mileage is to the nearest mile. If the denominator time differential is positive, the numerator mileage differential is assumed to be at least 1 mile if the calculated value is 0. (In this situation, a negative numerator must be considered to be an error.)

Because the recorded values may be small, the measurement error due to the built-in limit of the measuring equipment, i.e., clock and odometer, may cause severe distortion. For example: An ambulance that records a distance of 2 miles over a 12 minute time period would have a nominal rate of 10 m.p.h. However, the possible range of rates is from 4.6 to 16.4 m.p.h. If the values were larger the possible deviations would be smaller. Thus, a recorded distance of 20 miles over a 120 minute time period has an error range of less than 0.6 m.p.h. Table 2-5 presents the rate distributions.

Table 2-6 represents the delay in commencing treatment of a casualty in the field, after the arrival of an ambulance at the casualty. Several negative values were noted. These may represent the possibility that aid men left their vehicle to hunt for and begin treatment on casualties, with their ambulance catching up with them subsequently. Some of the large values that were recorded, however, must be suspect to other valid or erroneous causes of this phenomenon.

FIG. 2-5 FREQUENCY DISTRIBUTIONS - RATE OF AMBULANCE TRAVEL TO CASUALTY IN BATTLEFIELD

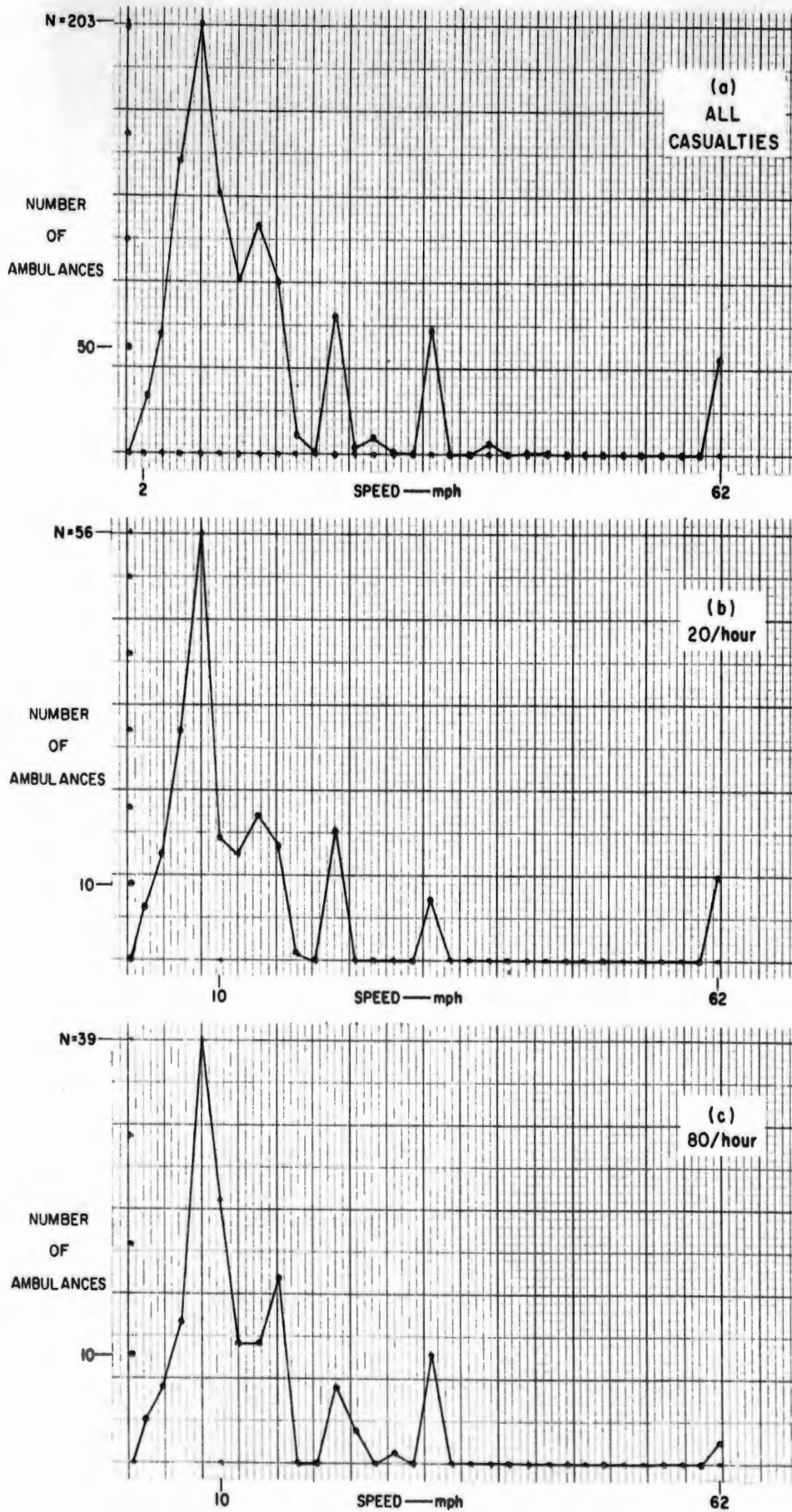


TABLE 2-5

FREQUENCY DISTRIBUTIONS - RATE OF AMBULANCE TRAVEL TO CASUALTY IN BATTLEFIELD

(a) Δt FROM H HOUR ALL CASUALTIES								(b) Δt FROM H HOUR 20/hour DISTRIBUTION								(c) Δt FROM H HOUR 80/hour DISTRIBUTION							
TOTAL NO. AMB.	VALID SAMPLE	MIN. SPEED	MAX. SPEED	AVG. SPEED	VAR.	DEV.		TOTAL NO. AMB.	VALID SAMPLE	MIN. SPEED	MAX. SPEED	AVG. SPEED	VAR.	DEV.		TOTAL NO. AMB.	VALID SAMPLE	MIN. SPEED	MAX. SPEED	AVG. SPEED	VAR.	DEV.	
1069	1015	0000	0130	13.32	193.4	13.91		0218	0208	0000	0060	12.37	166.	12.88		0161	0152	0000	0130	13.78	355.2	18.84	
FREQ. DISTRIB.								FREQ. DISTRIB.								FREQ. DISTRIB.							
		SPEED INTERVAL (MPH)	NO. OF AMB.							SPEED INTERVAL (MPH)	NO. OF AMB.							SPEED INTERVAL (MPH)	NO. OF AMB.				
		000-002	0027							000-002	0007							000-002	0004				
		002-004	0056							002-004	0014							002-004	0007				
		004-006	0137							004-006	0030							004-006	0013				
		006-008	0203							006-008	0056							006-008	0039				
		008-010	0122							008-010	0016							008-010	0024				
		010-012	0082							010-012	0014							010-012	0011				
		012-014	0107							012-014	0019							012-014	0011				
		014-016	0081							014-016	0015							014-016	0017				
		016-018	0009							016-018	0001							016-018	0000				
		018-020	0001							018-020	0000							018-020	0000				
		020-022	0063							020-022	0017							020-022	0007				
		022-024	0003							022-024	0000							022-024	0003				
		024-026	0008							024-026	0000							024-026	0000				
		026-028	0001							026-028	0000							026-028	0001				
		028-030	0000							028-030	0000							028-030	0000				
		030-032	0058							030-032	0008							030-032	0010				
		032-034	0000							032-034	0000							032-034	0000				
		034-036	0000							034-036	0000							034-036	0000				
		036-038	0005							036-038	0000							036-038	0000				
		038-040	0000							038-040	0000							038-040	0000				
		040-042	0001							040-042	0000							040-042	0000				
		042-044	0001							042-044	0000							042-044	0000				
		044-046	0000							044-046	0000							044-046	0000				
		046-048	0000							046-048	0000							046-048	0000				
		048-050	0000							048-050	0000							048-050	0000				
		050-052	0000							050-052	0000							050-052	0000				
		052-054	0000							052-054	0000							052-054	0000				
		054-056	0000							054-056	0000							054-056	0000				
		056-058	0000							056-058	0000							056-058	0000				
		058-060	0000							058-060	0000							058-060	0000				
		060-062	0045							060-062	0011							060-062	0002				
		062-130	0000															062-130	0000				
		130-132	0003															130-132	0003				

Table 2-6

FREQUENCY DISTRIBUTION/TIME DIFFERENCE,
AMBULANCE ARRIVAL AND START OF FIELD TREATMENT

Time Difference (Min.) From Ambulance Arrival to Start of Field Commencement of Treatment	Casualties	Percent of Total
less than -60	8	.75
-60 to -31	24	2.26
-30 to -1	61	5.75
0	308	29.06
+1 to +30	598	56.42
greater than +30	9	.85
invalid samples	<u>52</u>	<u>4.91</u>
	1060	100.00

III REMOVAL ACTIVITIES

This section develops information pertaining to the physical movement of casualties through the medical system. In the previous section, vehicle rate was defined. The rate distribution of travel between field and company area, field and aid station, and between company area and aid station are developed in Tables 3-1 through 3-3. The corresponding graphed distributions are Figs. 3-1 through 3-3. The corresponding information for travel from the aid station to division are unobtainable since the necessary mileages were not recorded.

Two operations that consumed uniformly small amounts of time were casualty loading and unloading. Examples are specified in Table 3-4.

Table 3-4

CASUALTY LOADING AND UNLOADING TIMES

Field, Ambulance Loading Times		Aid Station, Ambulance Unloading Times	
Maximum	27 min	Maximum	63 min
Minimum	0 min	Minimum	0 min
Average	1.8 min	Average	1.3 min
82% in less than 2 minutes		92% in less than 2 minutes	

Tables 3-5 and 3-6 indicate the ambulance loading density from the field and from the company area, respectively. For the three standard breakdowns, the number of ambulances evacuating, and the number of casualties being evacuated, over 15-minute intervals from H-hour are noted. The maximum and minimum ambulance loads during the periods are listed and the average load for each interval is computed. Table 3-7 is a coarse distribution of the number of casualties evacuated per ambulance.

There were 72 incidents of casualties being loaded in the field, then unloaded in the field, to be evacuated subsequently by a second

FIG. 3-1 FREQUENCY DISTRIBUTIONS - RATE OF CASUALTY TRAVEL,
BATTLEFIELD TO COMPANY AREA

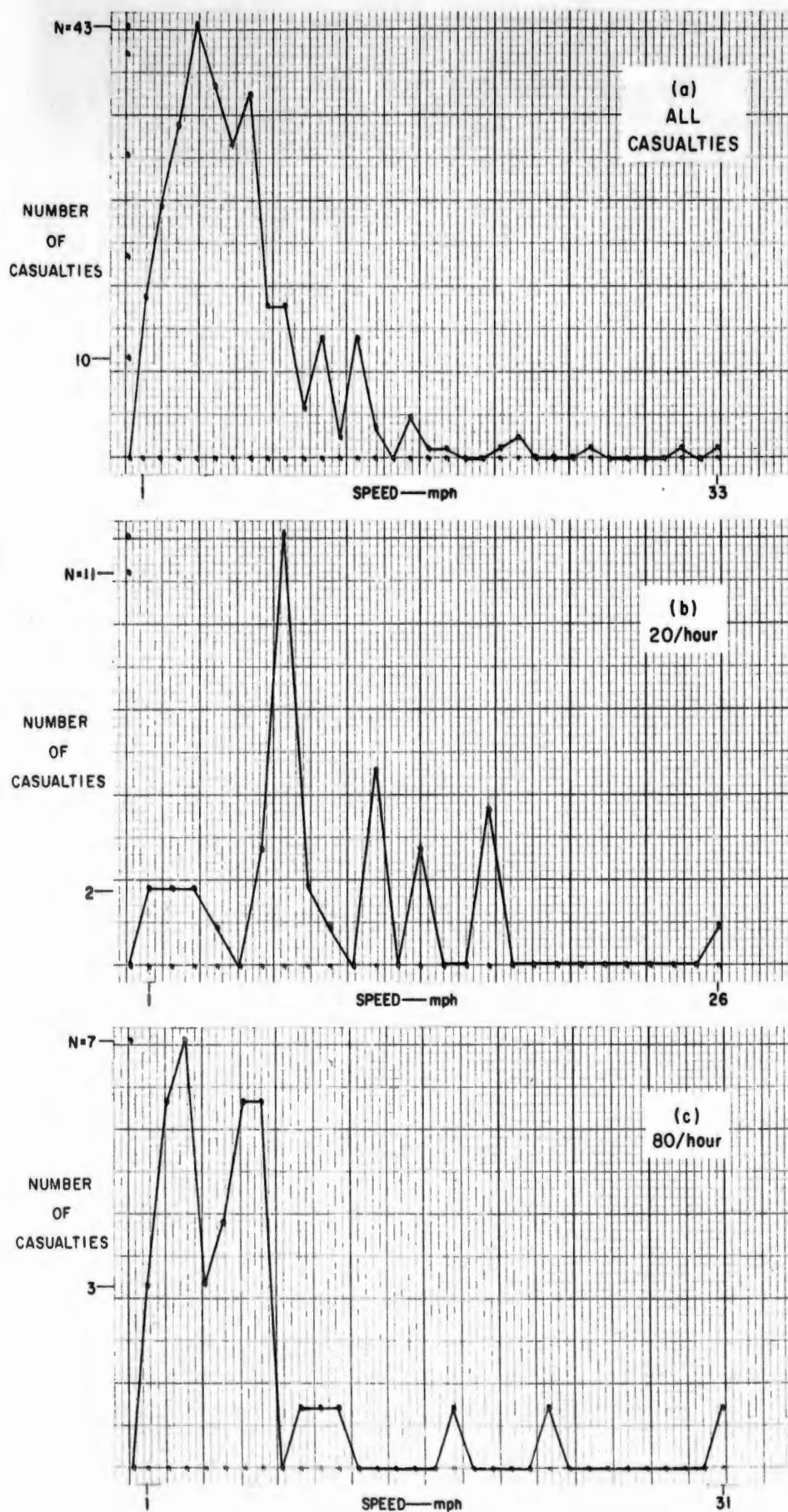


TABLE 3-1
FREQUENCY DISTRIBUTIONS - RATE OF CASUALTY TRAVEL,
BATTLEFIELD TO COMPANY AREA

(a)							(b)							(c)						
Δt FROM H HOUR ALL CASUALTIES							Δt FROM H HOUR 20/hour DISTRIBUTION							Δt FROM H HOUR 80/hour DISTRIBUTION						
TOTAL NO. CAS.	VALID SAMPLE	MIN. SPEED	MAX. SPEED	AVG. SPEED	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLE	MIN. SPEED	MAX. SPEED	AVG. SPEED	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLE	MIN. SPEED	MAX. SPEED	AVG. SPEED	VAR.	DEV.
0299	0299	0001	0120	6.458	106.1	10.30	0037	0037	0001	0026	7.981	25.34	5.034	0041	0041	0001	0030	5.434	32.12	5.668
FREQ. DISTRIB.							FREQ. DISTRIB.							FREQ. DISTRIB.						
		SPEED INTERVAL (MPH)	NO. OF CAS.						SPEED INTERVAL (MPH)	NO. OF CAS.						SPEED INTERVAL (MPH)	NO. OF CAS.			
		000-001	0016						000-001	0002						000-001	0003			
		001-002	0025						001-002	0002						001-002	0006			
		002-003	0033						002-003	0002						002-003	0007			
		003-004	0043						003-004	0001						003-004	0003			
		004-005	0037						004-005	0000						004-005	0004			
		005-006	0031						005-006	0003						005-006	0006			
		006-007	0036						006-007	0011						006-007	0006			
		007-008	0015						007-008	0002						007-008	0000			
		008-009	0015						008-009	0001						008-009	0001			
		009-010	0005						009-010	0000						009-010	0001			
		010-011	0012						010-011	0005						010-011	0001			
		011-012	0002						011-012	0000						011-012	0000			
		012-013	0012						012-013	0003						012-013	0000			
		013-014	0003						013-014	0000						013-014	0000			
		014-015	0000						014-015	0000						014-015	0000			
		015-016	0004						015-016	0004						015-016	0000			
		016-017	0001						016-017	0000						016-017	0001			
		017-018	0001						017-018	0000						017-018	0000			
		018-019	0000						018-019	0000						018-019	0000			
		019-020	0000						019-020	0000						019-020	0000			
		020-021	0001						020-021	0000						020-021	0000			
		021-022	0002						021-022	0000						021-022	0001			
		022-023	0000						022-023	0000						022-023	0000			
		023-024	0000						023-024	0000						023-024	0000			
		024-025	0000						024-025	0000						024-025	0000			
		025-026	0001						025-026	0001						025-026	0000			
		026-027	0000													026-027	0000			
		027-028	0000													027-028	0000			
		028-029	0000													028-029	0000			
		029-030	0000													029-030	0000			
		030-031	0001													030-031	0001			
		031-032	0000																	
		032-033	0001																	
		033-120	0000																	
		120-121	0002																	

**FIG. 3-2 FREQUENCY DISTRIBUTIONS - RATE OF CASUALTY TRAVEL,
BATTLEFIELD TO AID STATION**

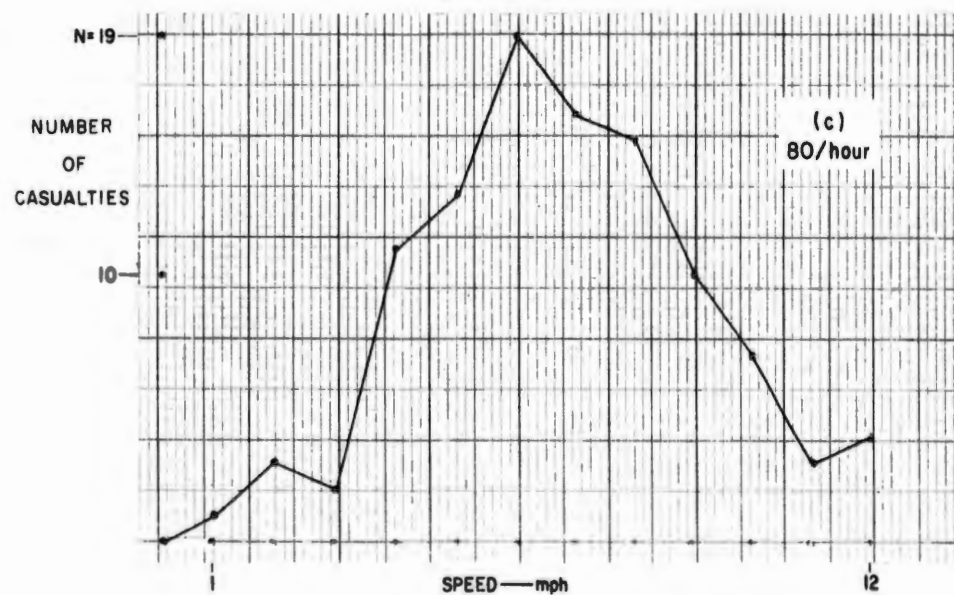
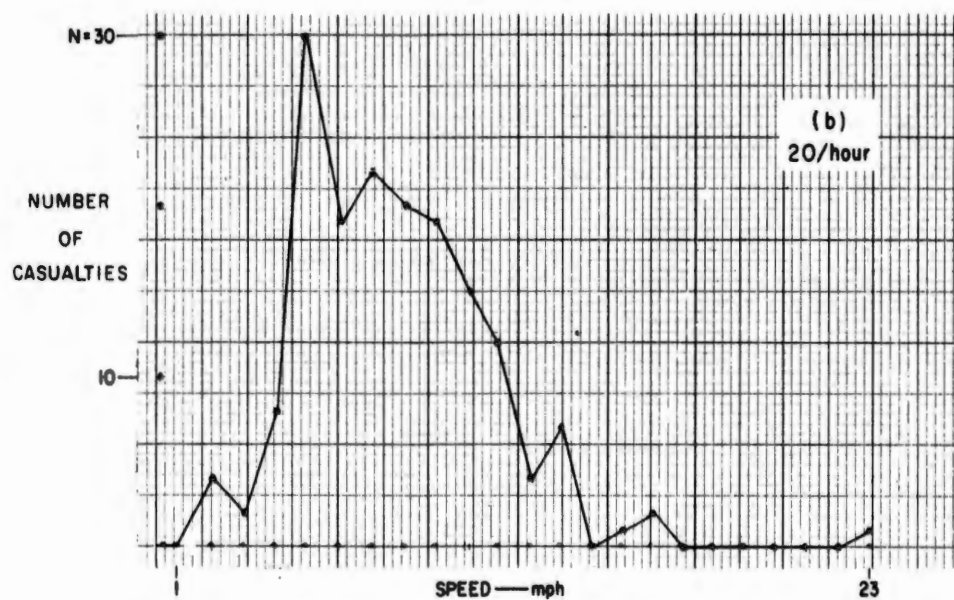
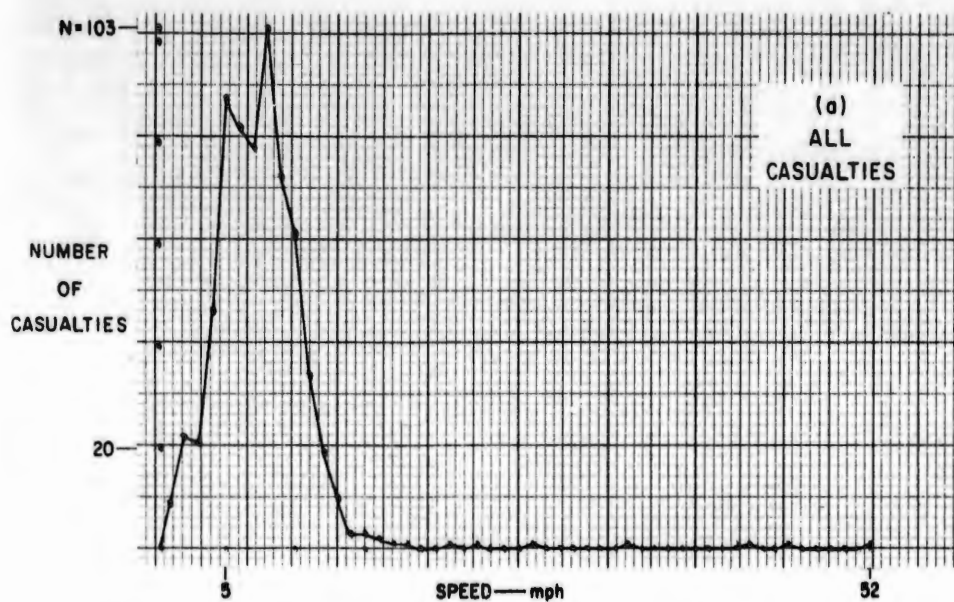


TABLE 3-2
FREQUENCY DISTRIBUTIONS - RATE OF CASUALTY TRAVEL,
BATTLEFIELD TO AID STATION

(a)							(b)							(c)											
Δt FROM H HOUR ALL CASUALTIES							Δt FROM H HOUR 20/hour DISTRIBUTION							Δt FROM H HOUR 80/hour DISTRIBUTION											
TOTAL NO. CAS.	VALID SAMPLE	MIN. SPEED	MAX. SPEED	AVG. SPEED	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLE	MIN. SPEED	MAX. SPEED	AVG. SPEED	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLE	MIN. SPEED	MAX. SPEED	AVG. SPEED	VAR.	DEV.					
0669	0669	0001	0176	7.226	99.47	7.708	0167	0167	0001	0051	7.425	20.27	4.502	0104	0104	0001	0011	6.232		2.370					
FREQ. DISTRIB.							FREQ. DISTRIB.							FREQ. DISTRIB.											
		SPEED INTERVAL (MPH)	NO. OF CAS.							SPEED INTERVAL (MPH)	NO. OF CAS.							SPEED INTERVAL (MPH)	NO. OF CAS.						
		000-001	0009							000-001	0000							000-001	0001						
		001-002	0022							001-002	0004							001-002	0003						
		002-003	0021							002-003	0002							002-003	0002						
		003-004	0047							003-004	0008							003-004	0011						
		004-005	0089							004-005	0030							004-005	0013						
		005-006	0083							005-006	0019							005-006	0019						
		006-007	0079							006-007	0022							006-007	0016						
		007-008	0103							007-008	0020							007-008	0015						
		008-009	0073							008-009	0019							008-009	0010						
		009-010	0062							009-010	0013							009-010	0007						
		010-011	0034							010-011	0012							010-011	0003						
		011-012	0019							011-012	0004							011-012	0004						
		012-013	0010							012-013	0007														
		013-014	0003							013-014	0000														
		014-015	0003							014-015	0001														
		015-016	0002							015-016	0002														
		016-017	0001							016-017	0000														
		017-018	0001							017-018	0000														
		018-019	0000							018-019	0000														
		019-020	0000							019-020	0000														
		020-021	0001							020-021	0000														
		021-022	0000							021-022	0000														
		022-023	0001							022-023	0001														
		023-024	0000							023-024	0000														
		024-025	0000							024-025	0000														
		025-026	0000							025-026	0000														
		026-027	0001							026-027	0000														
		027-028	0000							027-028	0000														
		028-029	0001							028-029	0000														
		029-030	0000							029-030	0000														
		030-031	0000							030-031	0000														
		031-032	0001							031-032	0001														
		032-033	0000							032-033	0000														
		033-034	0001							033-034	0000														
		034-042	0000							034-042	0000														
		042-043	0001							042-043	0000														
		043-044	0000							043-044	0000														
		044-045	0000							044-045	0000														
		045-046	0001							045-046	0000														
		046-051	0000							046-051	0000														
		051-052	0001							051-052	0000														
		052-176	0000							052-176	0000														
		176-177	0001							176-177	0000														

FIG. 3-3 FREQUENCY DISTRIBUTIONS - RATE OF CASUALTY TRAVEL,
COMPANY AREA TO AID STATION

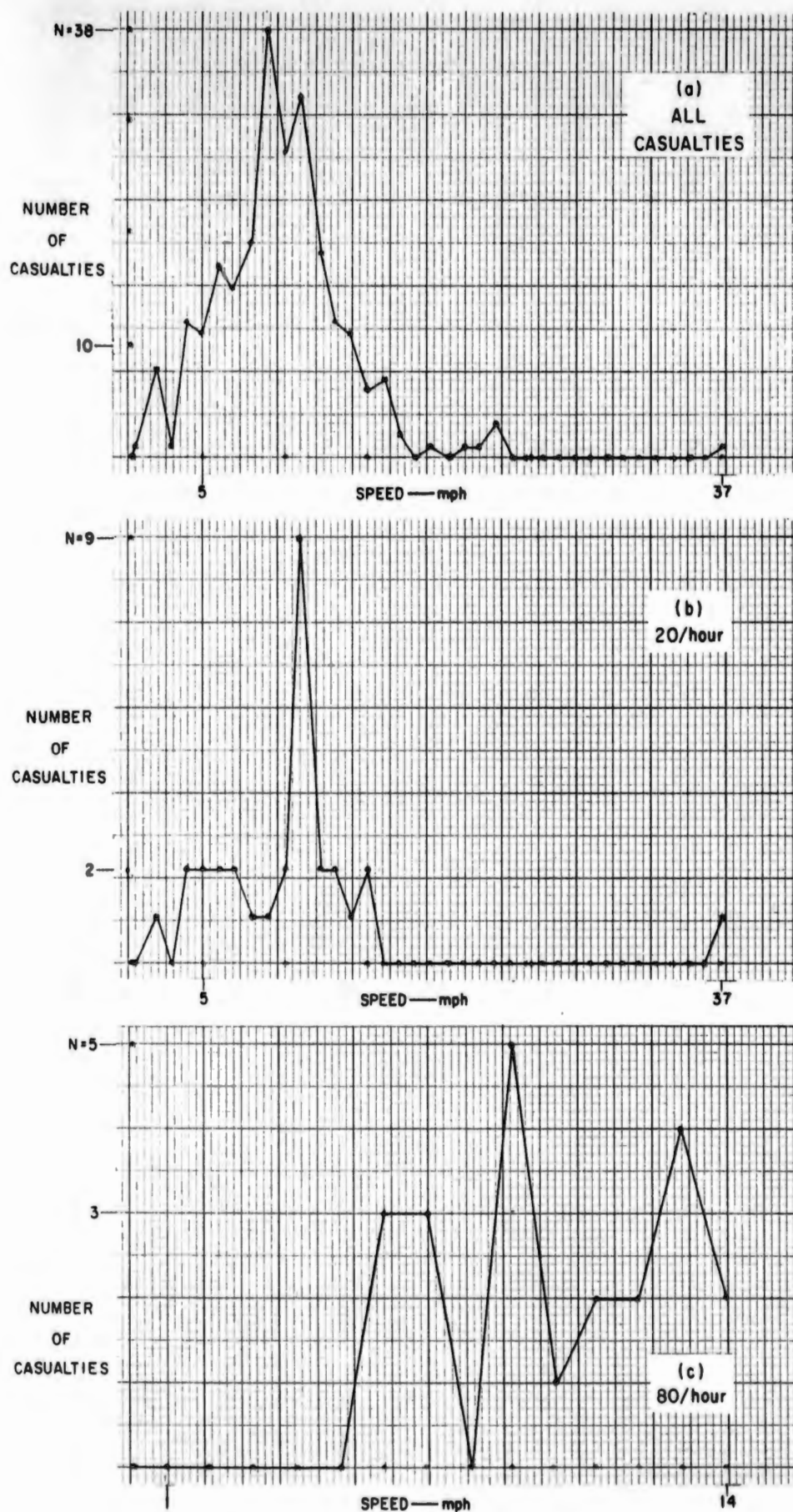


TABLE 3-3

FREQUENCY DISTRIBUTIONS - RATE OF CASUALTY TRAVEL,
COMPANY AREA TO AID STATION

(a) Δt FROM H HOUR ALL CASUALTIES								(b) Δt FROM H HOUR 20/hour DISTRIBUTION								(c) Δt FROM H HOUR 80/hour DISTRIBUTION							
TOTAL NO. CAS.	VALID SAMPLE	MIN. SPEED	MAX. SPEED	AVG. SPEED	VAR.	DEV.		TOTAL NO. CAS.	VALID SAMPLE	MIN. SPEED	MAX. SPEED	AVG. SPEED	VAR.	DEV.		TOTAL NO. CAS.	VALID SAMPLE	MIN. SPEED	MAX. SPEED	AVG. SPEED	VAR.	DEV.	
0080	0030	0001	0036	9.893	35.48	5.937		0247	0247	0000	0300	11.76	620.7	24.91		0022	0022	0005	0013	9.563		2.749	
FREQ. DISTRIB.								FREQ. DISTRIB.								FREQ. DISTRIB.							
		SPEED INTERVAL (MPH)	NO. OF CAS.							SPEED INTERVAL (MPH)	NO. OF CAS.							SPEED INTERVAL (MPH)	NO. OF CAS.				
	000-001		0000						000-001		0001						000-001		0000				
	001-002		0001						001-002		0008						001-002		0000				
	002-003		0000						002-003		0001						002-003		0000				
	003-004		0002						003-004		0012						003-004		0000				
	004-005		0002						004-005		0011						004-005		0000				
	005-006		0002						005-006		0017						005-006		0003				
	006-007		0002						006-007		0015						006-007		0003				
	007-008		0001						007-008		0019						007-008		0000				
	008-009		0001						008-009		0038						008-009		0005				
	009-010		0002						009-010		0027						009-010		0001				
	010-011		0009						010-011		0032						010-011		0002				
	011-012		0002						011-012		0018						011-012		0002				
	012-013		0002						012-013		0012						012-013		0004				
	013-014		0001						013-014		0011						013-014		0002				
	014-015		0002						014-015		0006												
	015-016		0000						015-016		0007												
	016-017		0000						016-017		0002												
	017-018		0000						017-018		0000												
	018-019		0000						018-019		0001												
	019-020		0000						019-020		0000												
	020-021		0000						020-021		0001												
	021-022		0000						021-022		0001												
	022-023		0000						022-023		0003												
	023-024		0000						023-036		0000												
	024-025		0000						036-037		0001												
	025-026		0000						037-120		0000												
	026-027		0000						120-121		0001												
	027-028		0000						121-240		0000												
	028-029		0000						240-241		0001												
	029-030		0000						241-300		0000												
	030-031		0000						300-301		0001												
	031-032		0000																				
	032-033		0000																				
	033-034		0000																				
	034-035		0000																				
	035-036		0000																				
	036-037		0001																				

TABLE 3-5

AMBULANCE LOADING FROM THE FIELD

TIME INTERVAL (MINS)	ALL CASUALTIES (a)					20/HOUR DISTRIB. (b)					80/HOUR DISTRIB. (c)				
	TOTAL		AMBULANCE			TOTAL		AMBULANCE			TOTAL		AMBULANCE		
	NO. AMB	NO. CAS	LOADS MIN	LOADS MAX	LOADS AVG	NO. AMB	NO. CAS	LOADS MIN	LOADS MAX	LOADS AVG	NO. AMB	NO. CAS	LOADS MIN	LOADS MAX	LOADS AVG
000-015	01	01	1	1	1.0	01	01	1	1	1.0					
015-030	06	11	1	4	1.8	04	09	1	4	2.3					
030-045	10	22	1	6	2.2						02	08	2	6	4.0
045-060	21	59	1	5	2.8	06	15	2	4	2.5	04	16	3	5	4.0
060-075	13	43	1	5	3.3	06	14	1	4	2.3					
075-090	27	78	1	6	2.9	14	44	1	5	3.1	01	05	5	5	5.0
090-105	16	47	1	6	2.9	08	22	1	5	2.8	02	10	6	4	5.0
105-120	25	74	1	7	3.0	12	38	2	6	3.2	01	07	7	7	7.0
120-135	21	70	1	6	2.4	10	30	1	6	3.0	01	04	4	4	4.0
135-150	17	54	1	5	3.2	06	16	1	4	2.7	01	04	4	4	4.0
150-165	09	40	1	6	4.4	02	07	3	4	3.5					
165-180	11	41	2	6	3.7	01	03	3	3	3.0	02	11	5	6	5.5
180-195	11	36	1	8	3.3	03	06	1	3	2.0	01	08	8	8	8.0
195-210	08	30	1	6	3.8	03	07	2	3	2.3	02	11	5	6	5.5
210-225	09	28	1	6	3.1										
225-240	08	23	1	5	2.9	01	01	1	1	1.0	01	03	3	3	3.0
240-255	14	44	1	5	3.1	02	07	3	4	3.5	01	04	4	4	4.0
255-270	04	16	4	4	4.0						01	04	4	4	4.0
270-285	07	21	1	7	3.0						01	07	7	7	7.0
285-300	13	48	1	6	3.7						03	09	1	4	3.0
300-315	04	16	3	5	4.0						01	05	5	5	5.0
315-330	08	29	1	6	3.6										
330-345	04	18	4	5	4.5						01	04	4	4	4.0
345-360	04	12	2	5	3.0						01	05	5	5	5.0
360-375	03	10	2	5	3.3										
375-390	03	14	4	5	4.7						01	05	5	5	5.0
390-405	05	13	1	4	2.6						01	03	3	3	3.0
405-420	02	05	2	3	2.5										
420-435	03	07	2	3	2.3										
435-450	03	12	4	4	4.0						01	04	4	4	4.0
450-465	01	04	4	4	4.0										
465-480	03	12	3	5	4.0										
480-495	03	13	3	6	4.3						01	04	4	4	4.0
495-510	04	10	1	4	2.5						01	03	3	3	3.0
510-525	01	04	4	4	4.0										
525-540	02	06	2	4	3.0										
540-555	00	00	0	0	0.0										
555-570	02	06	1	5	3.0										
OVERALL	306	977	1	8	3.2	79	220	1	6	2.8	32	144	1	8	4.5

TABLE 3-6

AMBULANCE LOADING FROM COMPANY AREA

TIME INTERVAL (MINS)	ALL CASUALTIES (a)					20/HOUR DISTRIB. (b)					80/HOUR DISTRIB. (c)				
	TOTAL		AMBULANCE			TOTAL		AMBULANCE			TOTAL		AMBULANCE		
	NO. AMB	NO. CAS	LOADS MIN	LOADS MAX	LOADS AVG	NO. AMB	NO. CAS	LOADS MIN	LOADS MAX	LOADS AVG	NO. AMB	NO. CAS	LOADS MIN	LOADS MAX	LOADS AVG
000-015															
015-030															
030-045															
045-060	04	14	1	5	3.5	01	05	5	5	5.0					
060-075	03	14	4	6	4.7	01	06	6	6	6.0	01	04	4	4	4.0
075-090	07	26	3	4	3.7	02	08	4	4	4.0					
090-105	05	19	3	5	3.8	02	07	4	3	3.5	01	05	5	5	5.0
105-120	06	24	3	5	4.0	03	13	4	5	4.3					
120-135	07	25	1	5	3.6	02	09	4	5	4.5					
135-150	06	23	1	5	3.8	01	05	5	5	5.0	01	01	1	1	1.0
150-165	09	35	1	5	3.9	01	06	6	6	6.0	01	05	5	5	5.0
165-180	06	26	2	7	4.3										
180-195	01	04	4	4	4.0										
195-210	06	27	3	6	4.5	01	06	6	6	6.0					
210-225	06	16	1	6	2.7	01	03	3	3	3.0	05	13	1	6	2.6
225-240	05	21	4	5	4.2	01	04	4	4	4.0					
240-255	04	19	4	6	4.8	01	05	5	5	5.0					
255-270	03	12	2	7	4.0										
270-285	05	19	1	6	3.8						02	07	1	6	3.5
285-300	06	22	1	5	3.7										
300-315	05	26	1	8	5.2						01	08	8	8	8.0
315-330	02	14	5	9	7.0										
330-345	02	12	6	6	6.0										
345-360	03	16	5	6	5.3										
360-375	01	04	4	4	4.0						01	04	4	4	4.0
375-390	02	11	4	7	5.5										
390-405	02	11	5	6	5.5										
405-420	01	06	6	6	6.0						01	06	6	6	6.0
420-435	02	14	7	7	7.0										
435-450	04	22	4	6	5.5						01	06	6	6	6.0
450-465															
465-480	01	07	7	7	7.0										
480-495	01	04	4	4	4.0										
495-510	01	04	4	4	4.0										
510-525															
525-540	03	12	1	8	4.0						01	08	8	8	8.0
540-645															
645-660	01	01	1	1	1.0						01	01	1	1	1.0
OVERALL	120	510	1	9	4.3	17	77	3	6	4.5	17	68	1	8	4.0

ambulance. Presumably this occurred when personnel of loaded ambulances were forced to assign priority on the basis of criticalness of wound. We note the distribution of wound classes of the priority-delayed casualties.

Table 3-7
AMBULANCE LOADING FROM FIELD

Evacuees Per Ambulance	Total	Number of Ambulances	
		20/Hr.	80/Hr.
1	42	11	1
2	68	27	1
3	58	16	5
4	86	20	10
5	35	3	8
6	14	2	4
7	2	0	2
8	1	0	1

Table 3-8
PRIORITY DELAYED CASUALTIES, BY WOUND CLASS

Wound Class	Number	Percent
Immediate	8	11.1
Emergency	22	30.6
Delayed	42	58.3

The rate tables, 3-1 through 3-3, present a measure of ambulance efficiency, but do not permit a vision of the actual times involved. The remaining tables in this section, Tables 3-9 through 3-11, elapsed time and distance summaries, are similar to the corresponding tables in the preceding report (Report 4, Section 3). Table 3-9 is concerned with all casualties, while 3-10 and 3-11 refer to the 20/hr and 80/hr distributions, respectively. These summaries differ from the ones in the

prior report in that distances, being based on ambulance odometer readings, were recorded and are therefore summarized also. One should note that in comparing these values with the previous set of rate statistics that a measure of rate is not equal to the same measure of distance divided by that measure of time; measure being minimum, maximum, or average. In general, for average values:

$$\frac{1}{n} \sum_{i=1}^n \frac{\Delta d_i}{\Delta t_i} \neq \frac{\frac{1}{n} \sum_{i=1}^n \Delta d_i}{\frac{1}{n} \sum_{i=1}^n \Delta t_i} \quad (2)$$

These summaries are compiled for the following direct movements:

Field treatment area to company area

Field treatment area to aid station

Company area to aid station

Aid station to division.

Table 3-9
ELAPSED TIME AND DISTANCE SUMMARY--ALL CASUALTIES

Event	Workload (Delta Time from H-Hr)											
	No. of Samples		Minimum		Maximum		Average		Variance		Deviation	
	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)
Battlefield to Company Area												
Depart (Battlefield)	303	266	15	1	458	11	130.5	2.4	9074.0	3.3	95.26	1.81
Arrive (Company Area)	304		19		485		161.4		9799.0		98.99	
Battlefield to Aid Station												
Depart (Battlefield)	744	670	11	1	562	978	202.6	9.3	16873.7	2518.9	129.90	50.19
Arrive (Aid Station)	735		45		595		256.3		16609.8		128.08	
Company Area to Aid Station												
Depart (Company Area)	284	256	41	1	620	11	250.0	4.6	17200.2	3.0	131.15	1.72
Arrive (Aid Station)	300		72		567		278.2		16240.1		127.44	
**Aid Station to Division												
Depart (Aid Station)	670	*	66	*	602	*	294.2	*	15252.3	*	123.50	*
Arrive (Division)	652		96		655		348.2		15825.6		125.80	

* No mileage recorded for travel between these points.

** Division defined as either the airstrip or hospital.

Table 3-10
ELAPSED TIME AND DISTANCE SUMMARY--20 PER HOUR DISTRIBUTION

Event	Workload (Delta Time from H-Hr)											
	No. of Samples		Minimum		Maximum		Average		Variance		Deviation	
	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)
Battlefield to Company Area												
Depart (Battlefield)	34	28	15	1	154	7	67.2	2.0	1451.7	2.5	38.10	1.60
Arrive (Company Area)	35		19		158		89.6		1345.3		36.67	
Battlefield to Aid Station												
Depart (Battlefield)	173	168	11	1	251	15	99.1	5.6	2087.4	4.6	45.69	2.15
Arrive (Aid Station)	177		70		274		150.1		1886.0		43.42	
Company Area to Aid Station												
Depart (Company Area)	32	31	41	2	620	9	140.2	4.8	9850.3	4.6	99.25	2.14
Arrive (Aid Station)	34		72		255		155.1		2422.2		49.21	
**Aid Station to Division												
Depart (Aid Station)	33	*	101	*	286	*	189.4	*	3096.3	*	55.64	*
Arrive (Division)	34		177		458		254.5		4104.0		64.06	

*No mileage recorded for travel between these points.

**Division defined as either the airstrip or hospital.

Table 3-11
ELAPSED TIME AND DISTANCE SUMMARY--80 PER HOUR DISTRIBUTION
Workload (Delta Time from H-Hr)

Event	No. of Samples		Minimum		Maximum		Average		Variance		Deviation	
	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)	Δt (min)	Distance (miles)
Battlefield to Company Area												
Depart (Battlefield)	43	41	18	1	343	9	136.2	2.6	9486.0	4.8	97.40	2.20
Arrive (Company Area)	41		40		372		177.1		10457.0		102.26	
Battlefield to Aid Station												
Depart (Battlefield)	117	98	22	3	500	10	223.4	5.5	16754.2	1.5	129.44	1.24
Arrive (Aid Station)	117		90		558		282.7		16548.0		128.64	
Company Area to Aid Station												
Depart (Company Area)	34	25	68	3	528	9	300.9	4.7	19924.5	2.1	141.15	1.43
Arrive (Aid Station)	39		100		558		312.1		19339.7		139.07	
**Aid Station to Division												
Depart (Aid Station)	114	*	116	*	567	*	308.6	*	15540.2	*	124.66	*
Arrive (Division)	102		151		625		361.8		15798.0		125.69	

* No mileage recorded for travel between these points.

** Division defined as either the airstrip or hospital.

IV MEDICAL WORKLOAD

The workload of the medical personnel through the medical system can be documented by the number of casualties that are treated, how these casualties are distributed in time, and the amount of treatment rendered to the casualties. The time distributions of casualty arrivals at the various echelons of the system are presented in tabular form in Tables 4-1 through 4-4. Both the frequency and cumulative distributions are presented. Figures 4-1 through 4-4 graph the tables and depict an approximating polynomial for the normalized cumulative curve. The normalized overlay that is used in Report 4 is applicable to this set of graphs.

Table and Fig. 4-1 are concerned with casualty occurrence. Tables and Figs. 4-2 and 4-3 present the distribution of casualty arrivals at the company area and aid station, respectively. Table and Fig. 4-4 are the combined arrival information at the air strip and at the field hospital. Geographically, the air strip was very close to the field hospital. The casualties evacuated by air are presumably destined for the field hospital. Hence, the arrivals at the air strip are essentially both in fact and in time the responsibility and the workload of the field hospital.

The extent of treatment as measured by the time expended is presented in the next set of results. Table 4-5 is the distribution of treatment times per casualty in the field. For casualties that are treated several times in the field, the sum of these times is considered as the field treatment time for the casualty.

The cumulative treatment times versus time is presented in Table 4-6. Graphical representations of these two distributions are presented as Figs. 4-5 and 4-6. Tables 4-7 and 4-8, and Figs. 4-7 and 4-8 present the same information for the aid station.

FIG. 4-1 CUMULATIVE DISTRIBUTIONS - CASUALTY OCCURRENCE

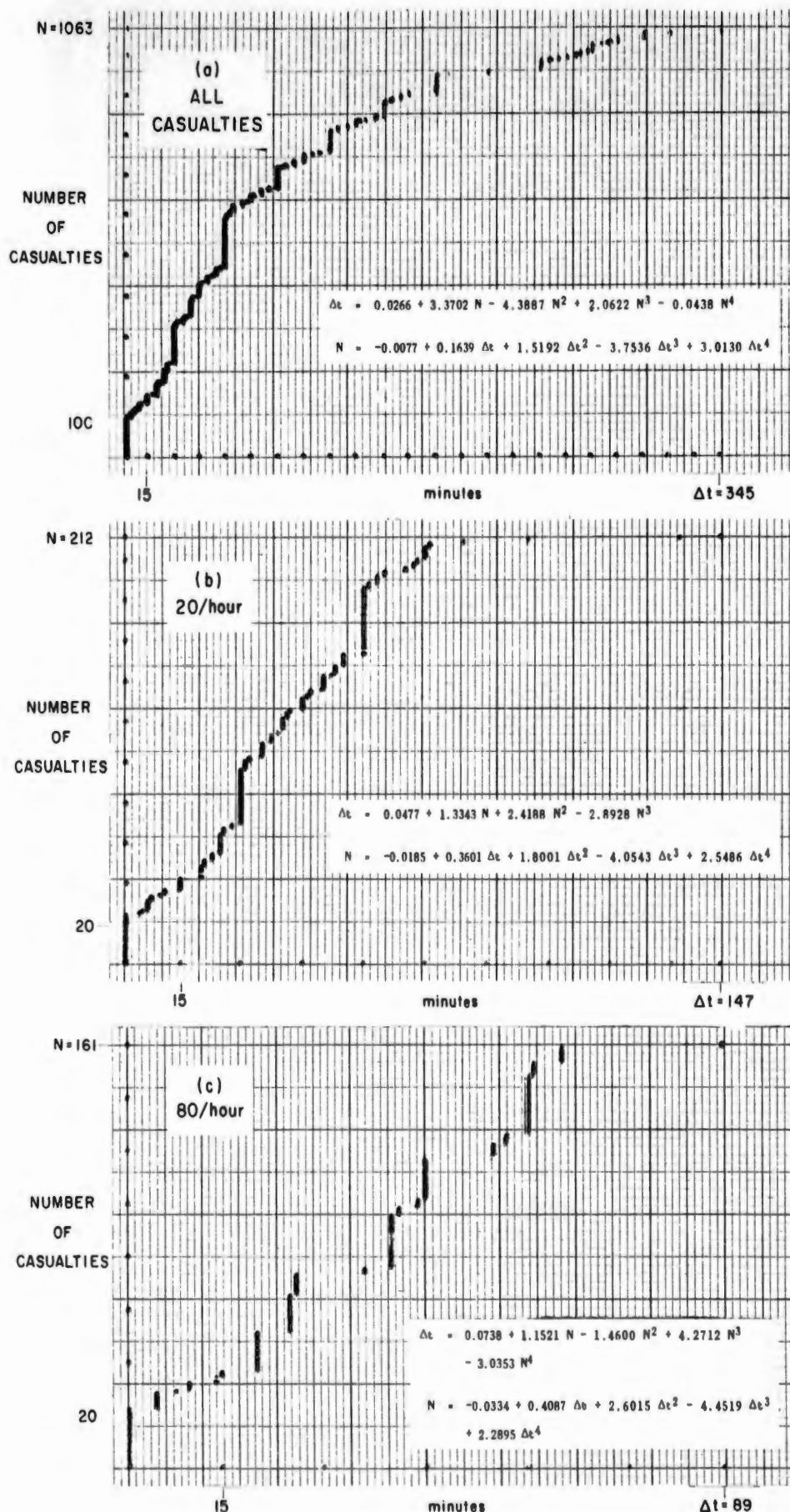


TABLE 4-1

FREQUENCY AND CUMULATIVE DISTRIBUTIONS - CASUALTY OCCURRENCE

(a)								(b)								(c)							
WORKLOAD (Δt FROM H HOUR) ALL CASUALTIES								WORKLOAD (Δt FROM H HOUR) 20/hour DISTRIBUTION								WORKLOAD (Δt FROM H HOUR) 80/hour DISTRIBUTION							
TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.		TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.		TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	
1069	1063	0000	0345	04.32	6021	77.59		0210	0212	0000	0147	38.11	604.1	24.97		0161	0161	0000	0089	34.32	479.6	21.89	
FREQ. DISTRIB.								FREQ. DISTRIB.								FREQ. DISTRIB.							
DELTA TIME INTERVAL (MINS)	NO. OF CAS.	DELTA TIME (MINS)	NO. OF CAS.					DELTA TIME INTERVAL (MINS)	NO. OF CAS.	DELTA TIME (MINS)	NO. OF CAS.					DELTA TIME INTERVAL (MINS)	NO. OF CAS.	DELTA TIME (MINS)	NO. OF CAS.				
000-015	0142	015	0142					000-015	0036	015	0036					000-015	0034	015	0034				
015-030	0096	030	0238					015-030	0033	030	0069					015-030	0039	030	0079				
030-045	0168	045	0406					030-045	0056	045	0125					030-045	0028	045	0101				
045-060	0070	060	0476					045-060	0028	060	0153					045-060	0029	060	0126				
060-075	0162	075	0638					060-075	0047	075	0200					060-075	0033	075	0159				
075-090	0034	090	0672					075-090	0009	090	0209					075-090	0002	090	0161				
090-105	0067	105	0739					090-105	0001	105	0210												
105-120	0023	120	0762					105-120	0000	120	0210												
120-135	0066	135	0828					120-135	0000	135	0210												
135-150	0021	150	0849					135-150	0002	150	0212												
150-165	0055	165	0904																				
165-180	0006	180	0910																				
180-195	0045	195	0955																				
195-210	0000	210	0955																				
210-225	0009	225	0964																				
225-240	0000	240	0964																				
240-255	0032	255	0996																				
255-270	0017	270	1013																				
270-285	0024	285	1037																				
285-300	0007	300	1044																				
300-315	0013	315	1057																				
315-330	0003	330	1060																				
330-345	0000	345	1060																				
345-360	0003	360	1063																				

FIG. 4-2 CUMULATIVE DISTRIBUTIONS – CASUALTY ARRIVAL AT COMPANY AREA

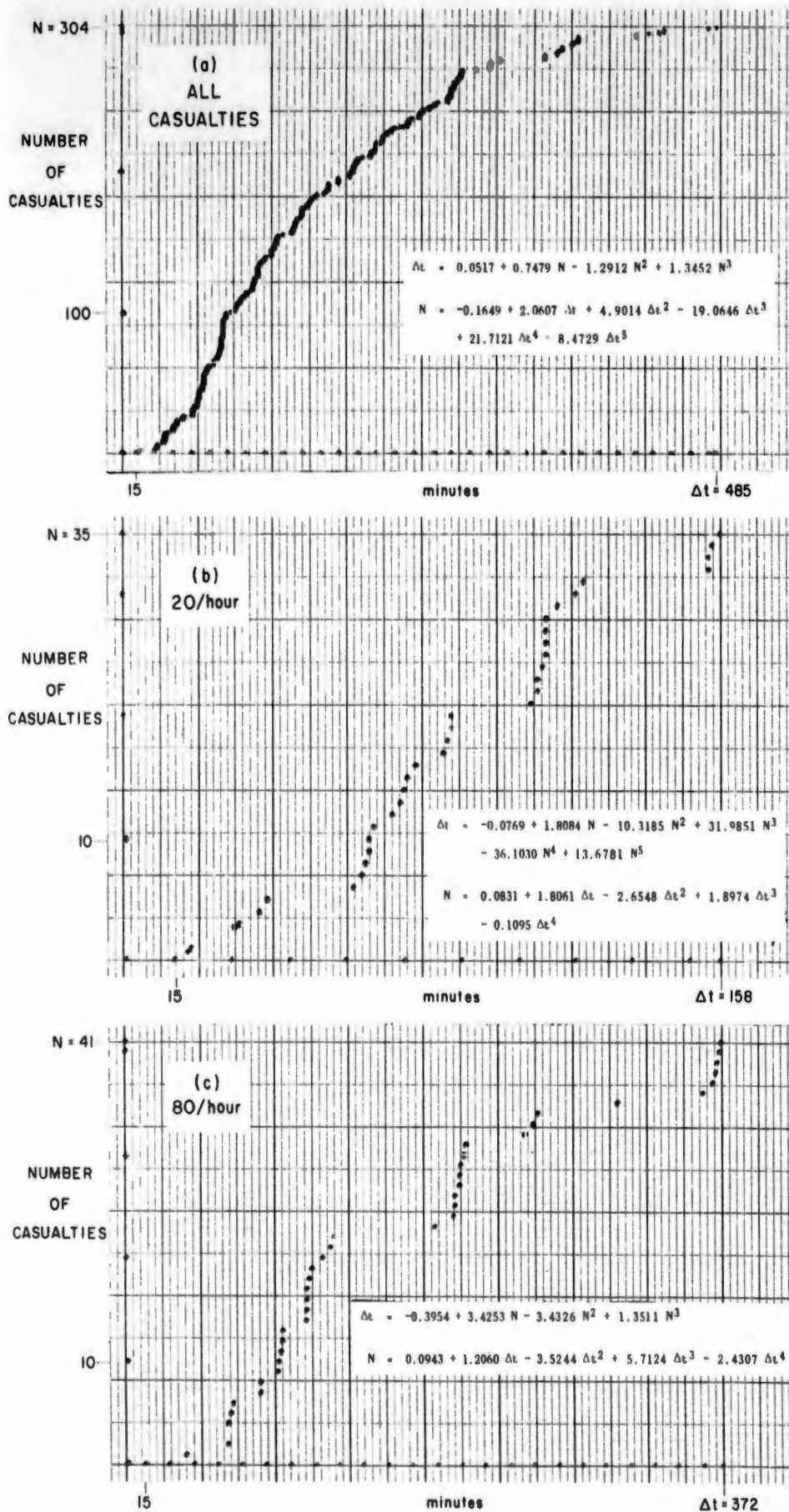


TABLE 4-2

FREQUENCY AND CUMULATIVE DISTRIBUTIONS - CASUALTY ARRIVAL AT COMPANY AREA

(a)							(b)							(c)						
WORKLOAD (Δt FROM H HOUR)							WORKLOAD (Δt FROM H HOUR)							WORKLOAD (Δt FROM H HOUR)						
ALL CASUALTIES							20/hour DISTRIBUTION							80/hour DISTRIBUTION						
TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.
0309	0304	0019	0485	161.4	9800	98.99	0043	0041	0040	0372	177.1	10456	102.2	0035	0035	0019	0158	89.60	1341	56.67
FREQ. DISTRIB.			CUMUL. DISTRIB.				FREQ. DISTRIB.			CUMUL. DISTRIB.				FREQ. DISTRIB.			CUMUL. DISTRIB.			
DELTA TIME INTERVAL (MINS)	NO. OF CAS.		DELTA TIME (MINS)	NO. OF CAS.			DELTA TIME INTERVAL (MINS)	NO. OF CAS.		DELTA TIME (MINS)	NO. OF CAS.			DELTA TIME INTERVAL (MINS)	NO. OF CAS.		DELTA TIME (MINS)	NO. OF CAS.		
000-015	0000		015	0000			000-015	0000		015	0000			000-015	0000		015	0000		
015-030	0001		030	0001			015-030	0000		030	0000			015-030	0001		030	0001		
030-045	0014		045	0015			030-045	0001		045	0001			030-045	0004		045	0005		
045-060	0011		060	0026			045-060	0000		060	0001			045-060	0000		060	0005		
060-075	0035		075	0061			060-075	0005		075	0006			060-075	0008		075	0013		
075-090	0036		090	0097			075-090	0002		090	0008			075-090	0007		090	0020		
090-105	0014		105	0111			090-105	0005		105	0013			090-105	0000		105	0020		
105-120	0025		120	0136			105-120	0006		120	0019			105-120	0009		120	0029		
120-135	0018		135	0154			120-135	0003		135	0022			120-135	0002		135	0031		
135-150	0013		150	0167			135-150	0000		150	0022			135-150	0000		150	0031		
150-165	0016		165	0183			150-165	0000		165	0022			150-165	0004		165	0035		
165-180	0010		180	0193			165-180	0000		180	0022									
180-195	0014		195	0207			180-195	0001		195	0023									
195-210	0008		210	0215			195-210	0004		210	0027									
210-225	0015		225	0230			210-225	0004		225	0031									
225-240	0008		240	0238			225-240	0000		240	0031									
240-255	0008		255	0246			240-255	0001		255	0032									
255-270	0010		270	0256			255-270	0002		270	0034									
270-285	0016		285	0272			270-285	0000		285	0034									
285-300	0001		300	0273			285-300	0000		300	0034									
300-315	0007		315	0280			300-315	0001		315	0035									
315-330	0000		330	0280			315-330	0000		330	0035									
330-345	0000		345	0280			330-345	0000		345	0035									
345-360	0008		360	0288			345-360	0000		360	0035									
360-375	0008		375	0296			360-375	0006		375	0041									
375-390	0000		390	0296																
390-405	0000		405	0296																
405-420	0000		420	0296																
420-435	0003		435	0299																
435-450	0003		450	0302																
450-465	0000		465	0302																
465-480	0001		480	0303																
480-495	0001		495	0304																

FIG. 4-3 CUMULATIVE DISTRIBUTIONS - CASUALTY ARRIVAL AT AID STATION

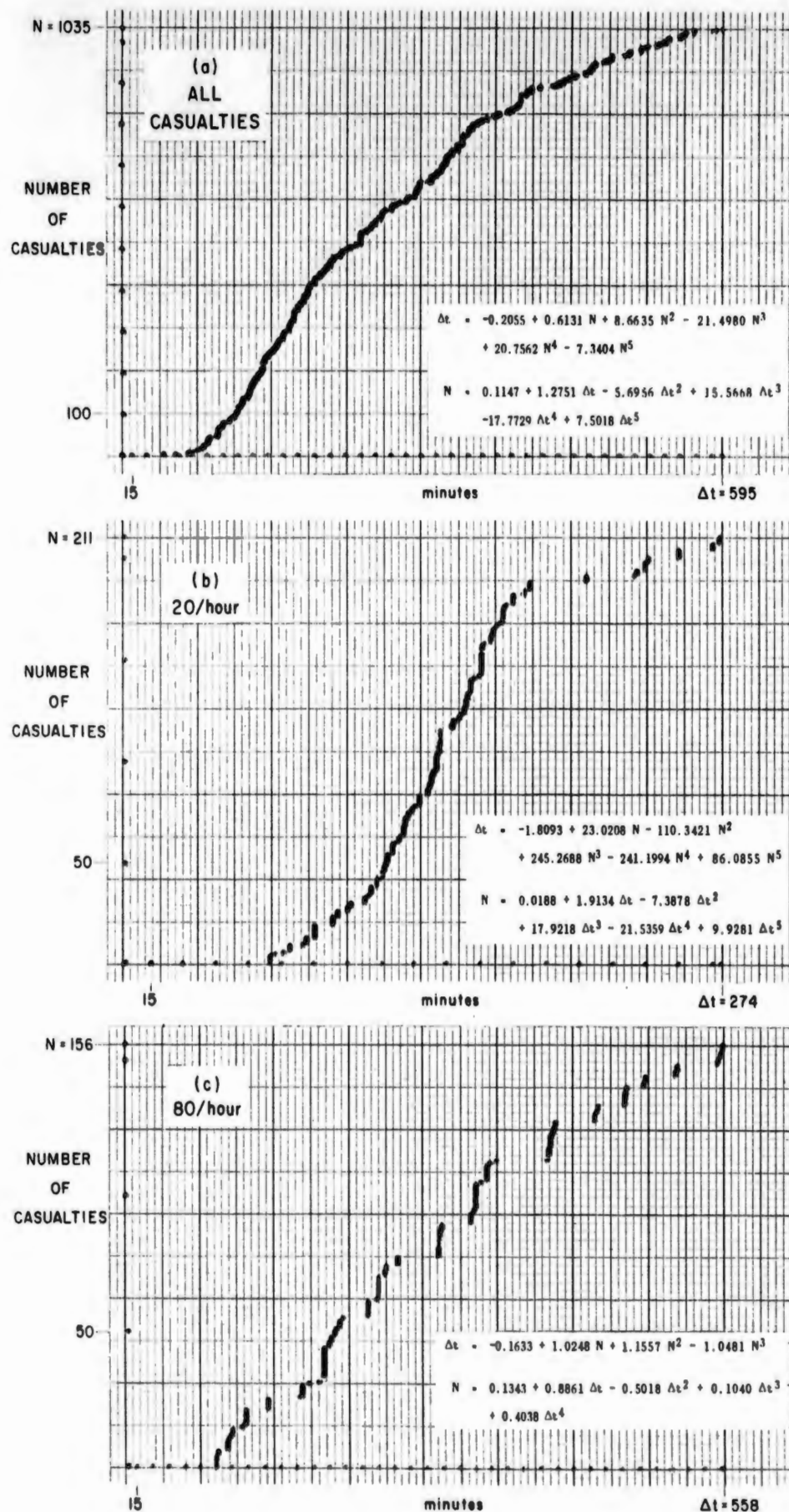


TABLE 4-3

FREQUENCY AND CUMULATIVE DISTRIBUTIONS - CASUALTY ARRIVAL AT AID STATION

(a) WORKLOAD (Δt FROM H HOUR) ALL CASUALTIES							(b) WORKLOAD (Δt FROM H HOUR) 20/hour DISTRIBUTION							(c) WORKLOAD (Δt FROM H HOUR) 80/hour DISTRIBUTION						
TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.
106 ^a	1035	0045	0595	262.6	16586	128.7	0212	0211	0070	0274	150.9	1964	44.92	0161	0156	0090	0558	290.0	17288	131.4
FREQ. DISTRIB.							FREQ. DISTRIB.							FREQ. DISTRIB.						
DELTA TIME INTERVAL (MINS)	NO. OF CAS.	DELTA TIME (MINS)	NO. OF CAS.				DELTA TIME INTERVAL (MINS)	NO. OF CAS.	DELTA TIME (MINS)	NO. OF CAS.				DELTA TIME INTERVAL (MINS)	NO. OF CAS.	DELTA TIME (MINS)	NO. OF CAS.			
000-015	0000	015	0000				000-015	0000	015	0000				000-015	0000	015	0000			
015-030	0000	030	0000				015-030	0000	030	0000				015-030	0000	030	0000			
030-045	0000	045	0000				030-045	0000	045	0000				030-045	0000	045	0000			
045-060	0004	060	0004				045-060	0000	060	0000				045-060	0000	060	0000			
060-075	0005	075	0009				060-075	0005	075	0005				060-075	0000	075	0000			
075-090	0018	090	0027				075-090	0008	090	0013				075-090	0000	090	0000			
090-105	0045	105	0072				090-105	0013	105	0026				090-105	0012	105	0012			
105-120	0035	120	0107				105-120	0017	120	0043				105-120	0009	120	0021			
120-135	0063	135	0170				120-135	0034	135	0077				120-135	0000	135	0021			
135-150	0069	150	0239				135-150	0038	150	0115				135-150	0004	150	0025			
150-165	0044	165	0283				150-165	0027	165	0142				150-165	0000	165	0025			
165-180	0066	180	0349				165-180	0035	180	0177				165-180	0006	180	0031			
180-195	0066	195	0415				180-195	0011	195	0188				180-195	0013	195	0044			
195-210	0044	210	0459				195-210	0000	210	0188				195-210	0011	210	0055			
210-225	0035	225	0494				210-225	0003	225	0191				210-225	0000	225	0055			
225-240	0018	240	0512				225-240	0003	240	0194				225-240	0007	240	0062			
240-255	0048	255	0560				240-255	0006	255	0200				240-255	0012	255	0074			
255-270	0032	270	0592				255-270	0004	270	0204				255-270	0003	270	0077			
270-285	0020	285	0612				270-285	0007	285	0211				270-285	0000	285	0077			
285-300	0047	300	0659											285-300	0012	300	0089			
300-315	0017	315	0676											300-315	0000	315	0089			
315-330	0051	330	0727											315-330	0006	330	0095			
330-345	0053	345	0780											330-345	0017	345	0112			
345-360	0029	360	0809											345-360	0001	360	0113			
360-375	0012	375	0821											360-375	0000	375	0113			
375-390	0013	390	0834											375-390	0000	390	0113			
390-405	0043	405	0877											390-405	0014	405	0127			
405-420	0014	420	0891											405-420	0000	420	0127			
420-435	0004	435	0895											420-435	0000	435	0127			
435-450	0022	450	0917											435-450	0006	450	0133			
450-465	0010	465	0927											450-465	0000	465	0133			
465-480	0024	480	0951											465-480	0007	480	0140			
480-495	0018	495	0969											480-495	0004	495	0144			
495-510	0010	510	0979											495-510	0000	510	0144			
510-525	0013	525	0992											510-525	0004	525	0148			
525-540	0012	540	1004											525-540	0000	540	0148			
540-555	0012	555	1016											540-555	0003	555	0151			
555-570	0014	570	1030											555-570	0005	570	0156			
570-585	0000	585	1030																	
585-600	0005	600	1035																	

FIG. 4-4 CUMULATIVE DISTRIBUTIONS - CASUALTY ARRIVAL AT DIVISION

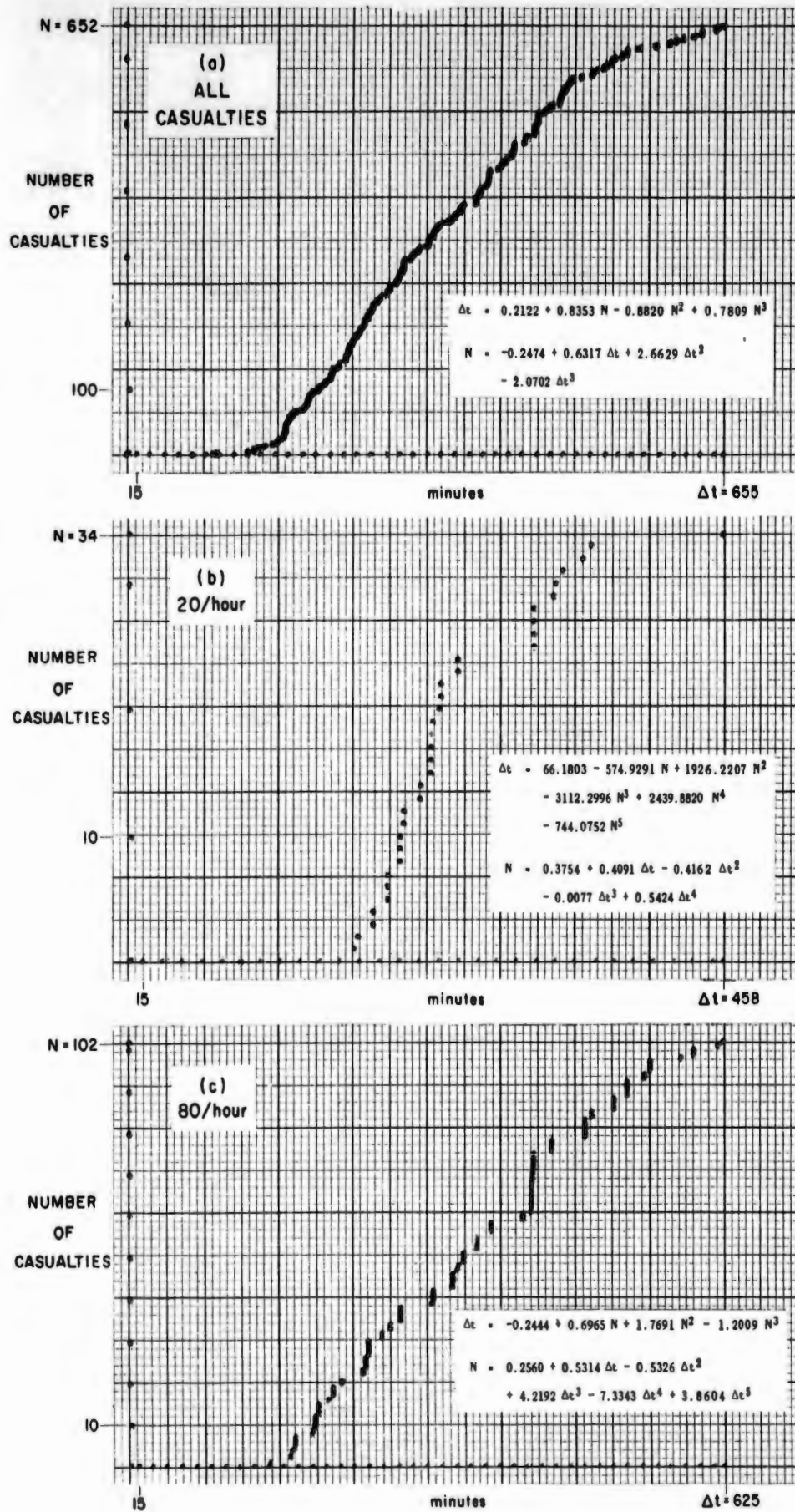


TABLE 4-4

FREQUENCY AND CUMULATIVE DISTRIBUTIONS - CASUALTY ARRIVAL AT DIVISION

(a)							(b)							(c)									
WORKLOAD (Δt FROM H HOUR)							WORKLOAD (Δt FROM H HOUR)							WORKLOAD (Δt FROM H HOUR)									
ALL CASUALTIES							20/hour DISTRIBUTION							80/hour DISTRIBUTION									
TOTAL NO. CAS.	VALID SAMPLF	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLF	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLF	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.			
0653	0652	0096	0655	348.2	15826	125.8	0034	0034	0177	0458	254.5	4104	64.06	0102	0102	0191	0625	161.8	15799	125.6			
FREQ. DISTRIB.		CUMUL. DISTRIB.						FREQ. DISTRIB.		CUMUL. DISTRIB.				FREQ. DISTRIB.		CUMUL. DISTRIB.							
DELTA TIME INTERVAL (MINS)	NO. OF CAS.	DELTA TIME (MINS)	NO. OF CAS.					DELTA TIME INTERVAL (MINS)	NO. OF CAS.	DELTA TIME (MINS)	NO. OF CAS.					DELTA TIME INTERVAL (MINS)	NO. OF CAS.	DELTA TIME (MINS)	NO. OF CAS.				
000-015	0000	015	0000					000-015	0000	015	0000					000-015	0000	015	0000				
015-030	0000	030	0000					015-030	0000	030	0000					015-030	0000	030	0000				
030-045	0000	045	0000					030-045	0000	045	0000					030-045	0000	045	0000				
045-060	0000	060	0000					045-060	0000	060	0000					045-060	0000	060	0000				
060-075	0000	075	0000					060-075	0000	075	0000					060-075	0000	075	0000				
075-090	0000	090	0000					075-090	0000	090	0000					075-090	0000	090	0000				
090-105	0003	105	0003					090-105	0000	105	0000					090-105	0000	105	0000				
105-120	0000	120	0003					105-120	0000	120	0000					105-120	0000	120	0000				
120-135	0000	135	0003					120-135	0000	135	0000					120-135	0000	135	0000				
135-150	0008	150	0011					135-150	0000	150	0000					135-150	0000	150	0000				
150-165	0006	165	0017					150-165	0000	165	0000					150-165	0001	165	0001				
165-180	0038	180	0055					165-180	0002	180	0002					165-180	0006	180	0007				
180-195	0014	195	0069					180-195	0002	195	0004					180-195	0001	195	0008				
195-210	0027	210	0096					195-210	0003	210	0007					195-210	0007	210	0014				
210-225	0021	225	0117					210-225	0005	225	0012					210-225	0004	225	0019				
225-240	0022	240	0139					225-240	0007	240	0019					225-240	0002	240	0021				
240-255	0044	255	0183					240-255	0005	255	0024					240-255	0009	255	0030				
255-270	0032	270	0215					255-270	0000	270	0024					255-270	0002	270	0032				
270-285	0027	285	0242					270-285	0000	285	0024					270-285	0002	285	0034				
285-300	0027	300	0269					285-300	0000	300	0024					285-300	0004	300	0038				
300-315	0033	315	0302					300-315	0004	315	0028					300-315	0000	315	0038				
315-330	0014	330	0316					315-330	0001	330	0029					315-330	0004	330	0042				
330-345	0032	345	0348					330-345	0002	345	0031					330-345	0004	345	0046				
345-360	0010	360	0358					345-360	0002	360	0033					345-360	0005	360	0051				
360-375	0020	375	0378					360-375	0000	375	0033					360-375	0004	375	0055				
375-390	0025	390	0403					375-390	0000	390	0033					375-390	0003	390	0058				
390-405	0027	405	0430					390-405	0000	405	0033					390-405	0000	405	0058				
405-420	0018	420	0448					405-420	0000	420	0033					405-420	0002	420	0060				
420-435	0022	435	0470					420-435	0000	435	0033					420-435	0015	435	0075				
435-450	0028	450	0498					435-450	0000	450	0033					435-450	0003	450	0078				
450-465	0029	465	0527					450-465	0001	465	0034					450-465	0000	465	0078				
465-480	0020	480	0547													465-480	0000	480	0078				
480-495	0023	495	0570													480-495	0007	495	0085				
495-510	0003	510	0573													495-510	0000	510	0085				
510-525	0014	525	0587													510-525	0003	525	0088				
525-540	0015	540	0602													525-540	0004	540	0092				
540-555	0012	555	0614													540-555	0005	555	0097				
555-570	0003	570	0617													555-570	0000	570	0097				
570-585	0004	585	0621													570-585	0001	585	0098				
585-600	0005	600	0626													585-600	0002	600	0100				
600-615	0007	615	0633													600-615	0000	615	0100				
615-630	0003	630	0636													615-630	0002	630	0102				
630-645	0008	645	0644																				
645-660	0008	660	0652																				

FIG. 4-5 FREQUENCY DISTRIBUTIONS - TREATMENT TIMES PER CASUALTY IN THE FIELD

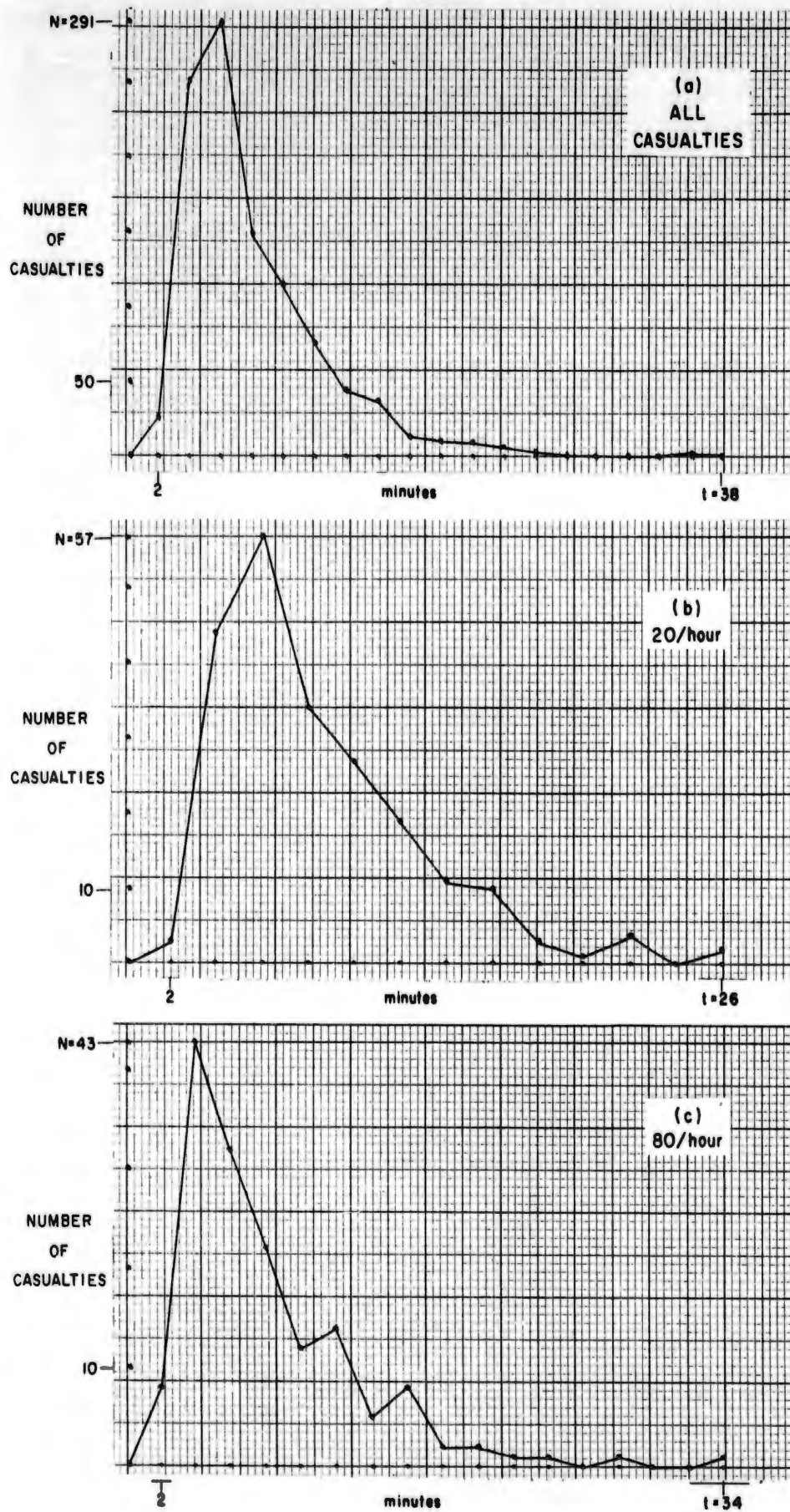


TABLE 4-5

FREQUENCY DISTRIBUTION - TREATMENT TIMES PER CASUALTY IN THE FIELD

TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.
1060	1041	0001	0124	6.844	46.22	6.798	0217	0215	0001	0025	6.958	20.4	4.517	0156	0152	0001	0033	6.618	27.61	5.255
FREQ. DISTRIB.							FREQ. DISTRIB.							FREQ. DISTRIB.						
		DELTA TIME INTERVAL (MINS)	NO. OF CAS.						DELTA TIME INTERVAL (MINS)	NO. OF CAS.						DELTA TIME INTERVAL (MINS)	NO. OF CAS.			
		000-002	0026						000-002	0003						000-002	0008			
		002-004	0292						002-004	0044						002-004	0043			
		004-006	0291						004-006	0057						004-006	0032			
		006-008	0148						006-008	0034						006-008	0022			
		008-010	0115						008-010	0027						008-010	0012			
		010-012	0076						010-012	0019						010-012	0014			
		012-014	0044						012-014	0011						012-014	0005			
		014-016	0037						014-016	0010						014-016	0008			
		016-018	0013						016-018	0003						016-018	0002			
		018-020	0010						018-020	0001						018-020	0002			
		020-022	0009						020-022	0004						020-022	0001			
		022-024	0006						022-024	0000						022-024	0001			
		024-026	0003						024-026	0002						024-026	0000			
		026-028	0001													026-028	0001			
		028-030	0000													028-030	0000			
		030-032	0001													030-032	0000			
		032-034	0001													032-034	0001			
		034-036	0003																	
		036-038	0001																	
		038-040	0000																	
		040-042	0000																	
		042-044	0000																	
		044-046	0000																	
		046-048	0000																	
		048-050	0000																	
		050-052	0000																	
		052-054	0000																	
		054-056	0000																	
		056-058	0000																	
		058-060	0000																	
		060-062	0000																	
		062-064	0001																	
		064-066	0001																	
		066-068	0000																	
		068-070	0000																	
		070-072	0001																	
		072-124	0000																	
		124-126	0001																	

FIG. 4-6 CUMULATIVE TREATMENT TIME vs. TIME, FIELD

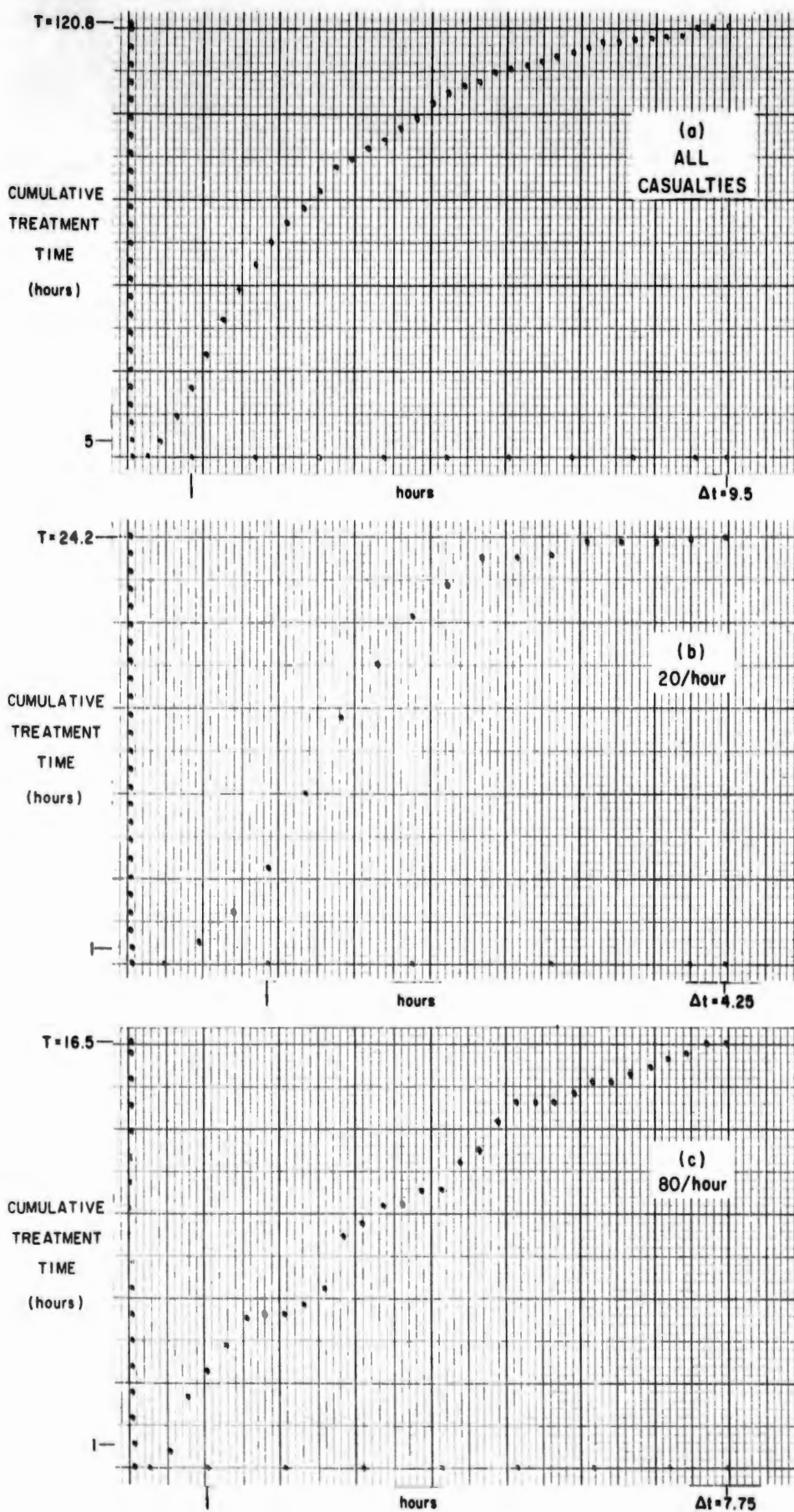


TABLE 4-6

CUMULATIVE TREATMENT TIME vs. TIME, FIELD

(a) Δt FROM H HOUR ALL CASUALTIES			(b) Δt FROM H HOUR 20/hour DISTRIBUTION			(c) Δt FROM H HOUR 80/hour DISTRIBUTION		
FREQ. DISTRIB. DELTA TIME INTERVAL (MINS)	NO. OF CAS. TREATED	CUMULATIVE TREATMENT TIME MINUTES	FREQ. DISTRIB. DELTA TIME INTERVAL (MINS)	NO. OF CAS. TREATED	CUMULATIVE TREATMENT TIME MINUTES	FREQ. DISTRIB. DELTA TIME INTERVAL (MINS)	NO. OF CAS. TREATED	CUMULATIVE TREATMENT TIME MINUTES
000-015	0003	0016	000-015	0002	0009	000-015	0000	0000
015-030	0048	0274	015-030	0011	0081	015-030	0010	0042
030-045	0069	0708	030-045	0014	0181	030-045	0022	0166
045-060	0072	1173	045-060	0024	0328	045-060	0009	0230
060-075	0076	1737	060-075	0034	0579	060-075	0006	0289
075-090	0075	2315	075-090	0034	0830	075-090	0011	0350
090-105	0066	2819	090-105	0027	1004	090-105	0002	0461
105-120	0060	3245	105-120	0023	1170	105-120	0002	0561
120-135	0061	3621	120-135	0016	1276	120-135	0004	0678
135-150	0044	3937	135-150	0009	1366	135-150	0005	0818
150-165	0035	4179	150-165	0002	1375	150-165	0014	0934
165-180	0039	4474	165-180	0003	1383	165-180	0006	0964
180-195	0036	4879	180-195	0004	1422	180-195	0005	0607
195-210	0029	5017	195-210	0001	1429	195-210	0002	0614
210-225	0032	5194	210-225	0001	1431	210-225	0005	0640
225-240	0025	5330	225-240	0003	1445	225-240	0003	0649
240-255	0030	5539	240-255	0001	1450	240-255	0007	0707
255-270	0027	5694				255-270	0003	0734
270-285	0035	5959				270-285	0010	0802
285-300	0024	6129				285-300	0007	0844
300-315	0017	6245				300-315	0000	0844
315-330	0011	6309				315-330	0000	0844
330-345	0024	6465				330-345	0005	0871
345-360	0010	6530				345-360	0003	0896
360-375	0006	6574				360-375	0001	0899
375-390	0012	6651				375-390	0002	0918
390-405	0006	6719				390-405	0002	0937
405-420	0015	6805				405-420	0001	0952
420-435	0012	6888				420-435	0002	0968
435-450	0014	6976				435-450	0004	0989
450-465	0005	6990				450-465	0001	0992
465-480	0006	7031						
480-495	0003	7048						
495-510	0007	7083						
510-525	0002	7091						
525-540	0004	7236						
540-555	0002	7246						
555-570	0002	7249						

FIG. 4.7 FREQUENCY DISTRIBUTIONS - TREATMENT TIMES PER CASUALTY AT AID STATION

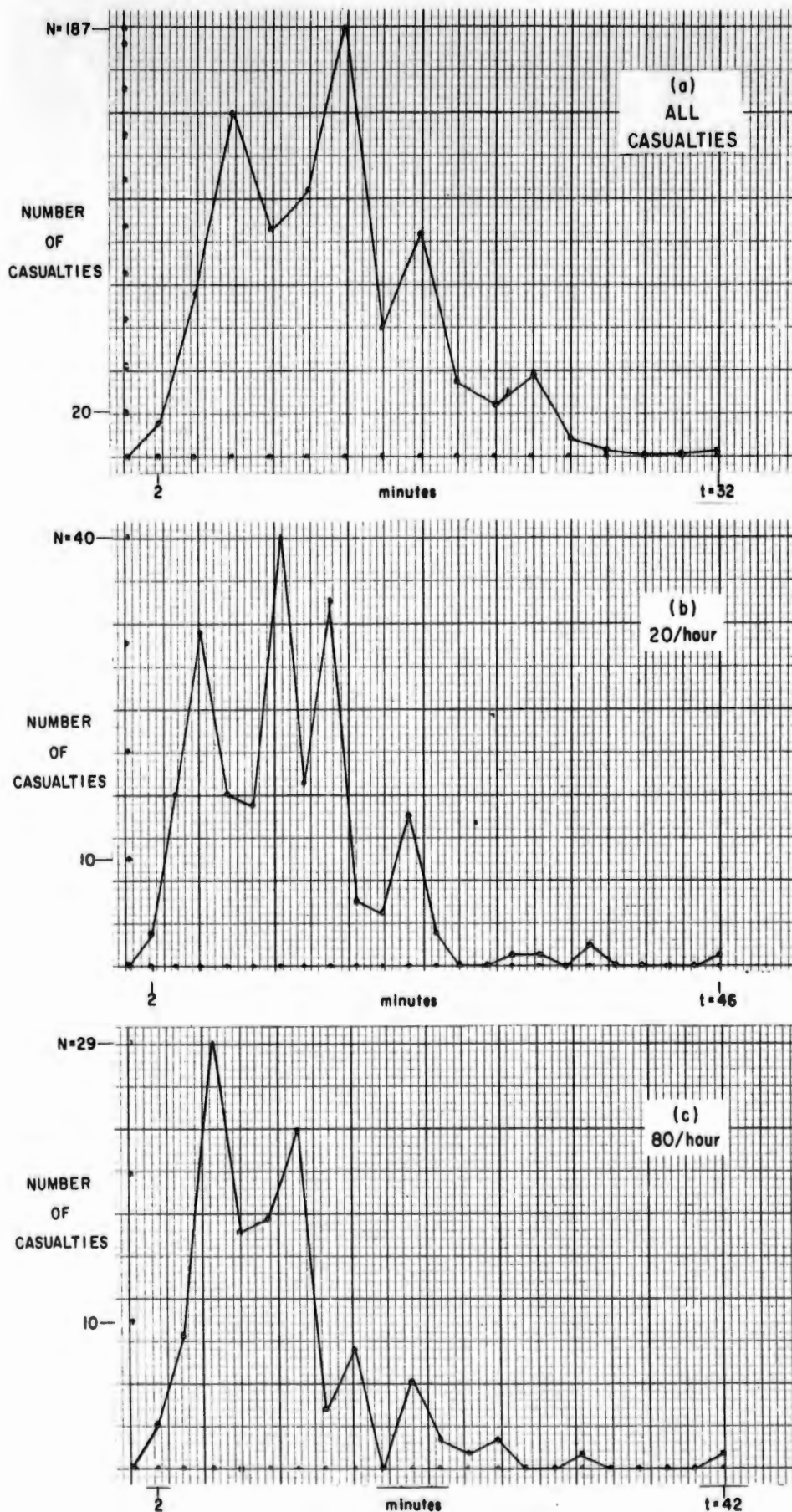


TABLE 4-7

FREQUENCY DISTRIBUTIONS - TREATMENT TIMES PER CASUALTY AT AID STATION

TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.	TOTAL NO. CAS.	VALID SAMPLE	MIN. DELTA TIME	MAX. DELTA TIME	AVG. DELTA TIME	VAR.	DEV.
1069	0909	0001	0110	10.18	151.8	11.48	0218	0205	0001	0045	10.93	42.9	6.550	0161	0122	0001	0040	9.032	36.82	6.068
FREQ. DISTRIB.							FREQ. DISTRIB.							FREQ. DISTRIB.						
		DELTA TIME INTERVAL (MINS)	NO. OF CAS.						DELTA TIME INTERVAL (MINS)	NO. OF CAS.						DELTA TIME INTERVAL (MINS)	NO. OF CAS.			
		000-002	0015						007-004	0016						000-002	0003			
		002-004	0071						004-006	0031						002-004	0009			
		004-006	0150						006-008	0016						004-006	0029			
		006-008	0099						008-010	0015						006-008	0016			
		008-010	0116						010-012	0040						008-010	0017			
		010-012	0187						012-014	0017						010-012	0029			
		012-014	0056						014-016	0034						012-014	0004			
		014-016	0097						016-018	0006						014-016	0008			
		016-018	0033						018-020	0005						016-018	0000			
		018-020	0023						020-022	0014						018-020	0006			
		020-022	0036						022-024	0003						020-022	0002			
		022-024	0008						024-026	0000						022-024	0001			
		024-026	0003						026-028	0000						024-026	0002			
		026-028	0001						028-030	0001						026-028	0000			
		028-030	0002						030-032	0001						028-030	0000			
		030-032	0003						032-034	0000						030-032	0001			
		032-034	0003						034-036	0002						032-034	0000			
		034-036	0001						036-038	0000						034-036	0000			
		036-038	0004						038-040	0000						036-038	0000			
		038-040	0001						040-042	0000						038-040	0000			
		040-042	0001						042-044	0000						040-042	0001			
		042-044	0000						044-046	0001										
		044-046	0001																	
		046-050	0000																	
		050-052	0001																	

FIG. 4-8 CUMULATIVE TREATMENT TIMES vs. TIME AID STATION

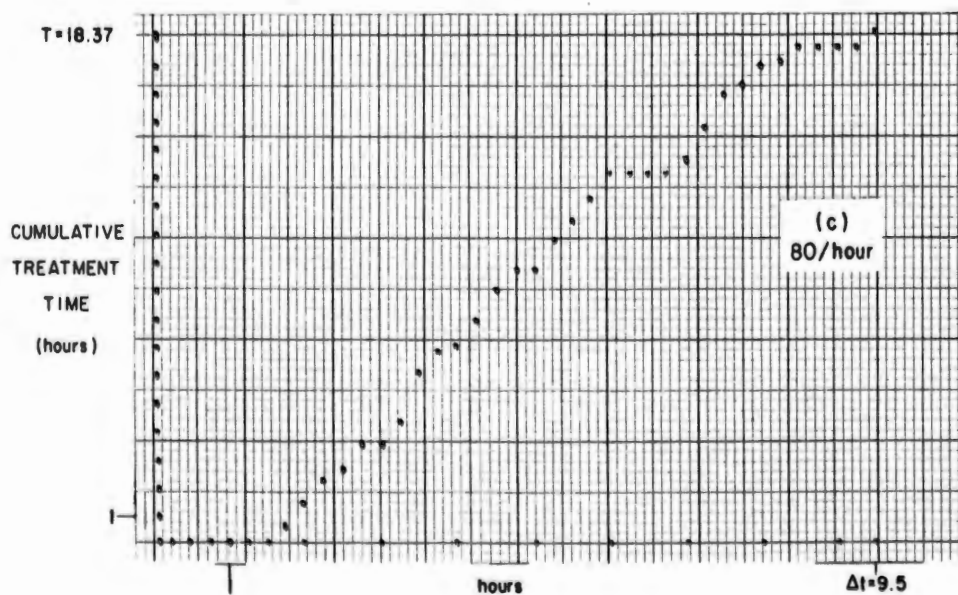
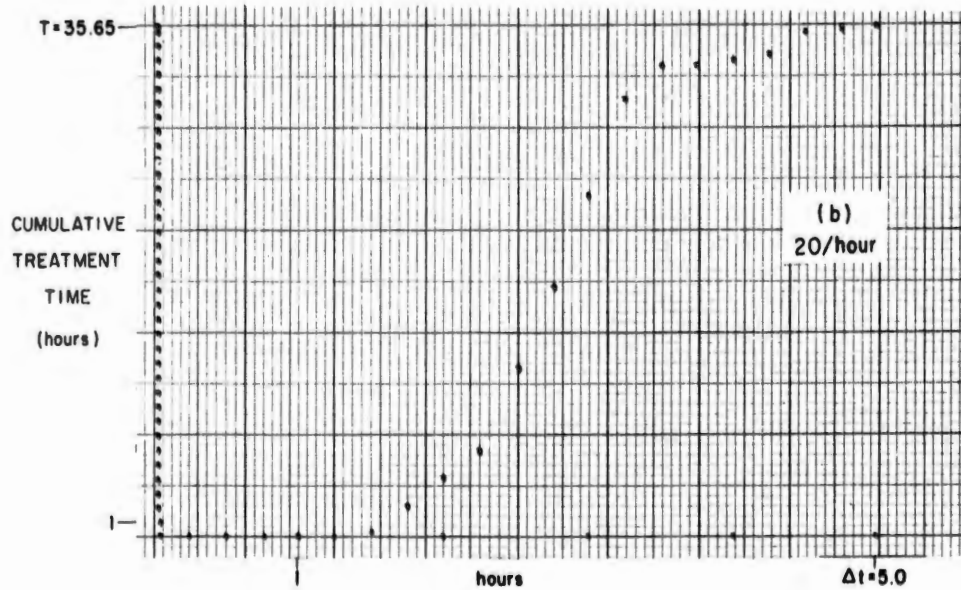
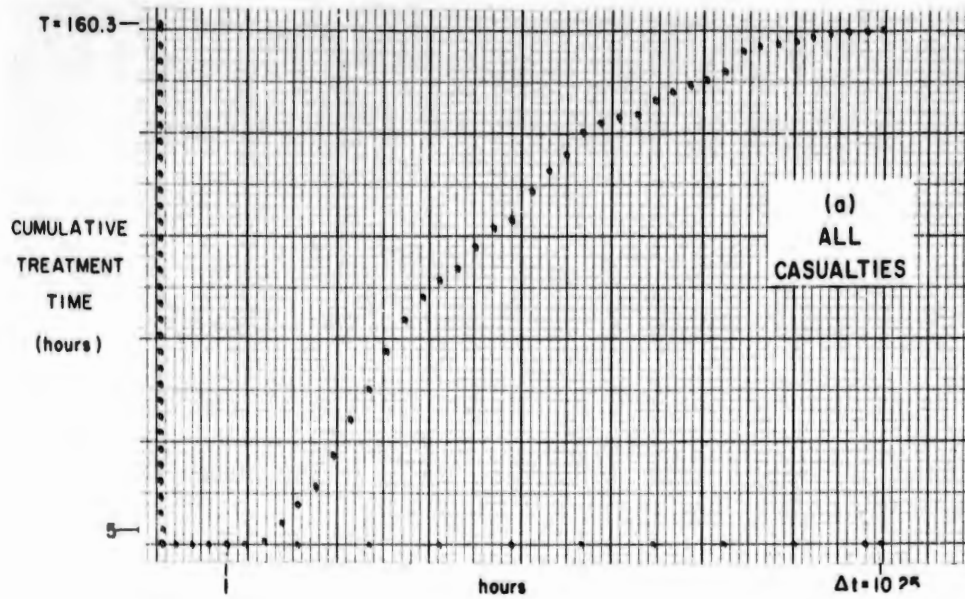


TABLE 4-8

CUMULATIVE TREATMENT TIMES vs. TIME, AID STATION

(a) Δt FROM H HOUR ALL CASUALTIES			(b) Δt FROM H HOUR 20/hour DISTRIBUTION			(c) Δt FROM H HOUR 80/hour DISTRIBUTION		
FREQ. DISTRIB.	CUMULATIVE TREATMENT TIME		FREQ. DISTRIB.	CUMULATIVE TREATMENT TIME		FREQ. DISTRIB.	CUMULATIVE TREATMENT TIME	
DELTA TIME INTERVAL (MINS)	NO. OF CAS. TREATED	MINUTES	DELTA TIME INTERVAL (MINS)	NO. OF CAS. TREATED	MINUTES	DELTA TIME INTERVAL (MINS)	NO. OF CAS. TREATED	MINUTES
000-015	0000	0000	000-015	0000	0000	000-015	0000	0000
015-030	0000	0000	015-030	0000	0000	015-030	0000	0000
030-045	0000	0000	030-045	0000	0000	030-045	0000	0000
045-060	0001	1009	045-060	0000	0000	045-060	0000	0000
060-075	0002	2020	060-075	0001	0000	060-075	0000	0000
075-090	0006	1085	075-090	0004	0033	075-090	0000	0000
090-105	0024	0417	090-105	0010	0138	090-105	0004	0036
105-120	0038	0769	105-120	0015	0254	105-120	0007	0089
120-135	0031	1096	120-135	0010	0366	120-135	0005	0138
135-150	0060	1681	135-150	0033	0698	135-150	0002	0199
150-165	0060	2352	150-165	0032	1032	150-165	0004	0214
165-180	0052	2916	165-180	0035	1408	165-180	0001	0217
180-195	0064	3608	180-195	0032	1802	180-195	0004	0262
195-210	0065	4202	195-210	0010	1951	195-210	0018	0368
210-225	0038	4618	210-225	0001	1956	210-225	0005	0411
225-240	0029	4918	225-240	0002	1981	225-240	0005	0427
240-255	0027	5144	240-255	0005	2015	240-255	0007	0480
255-270	0035	5541	255-270	0004	2090	255-270	0005	0545
270-285	0031	5895	270-285	0006	2129	270-285	0003	0585
285-300	0016	6045	285-300	0001	2139	285-300	0001	0586
300-315	0022	6601				300-315	0008	0652
315-330	0043	7002				315-330	0002	0688
330-345	0036	7276				330-345	0010	0735
345-360	0043	7689				345-360	0007	0795
360-375	0020	7856				360-375	0000	0795
375-390	0012	7960				375-390	0000	0795
390-405	0008	8024				390-405	0000	0795
405-420	0031	8289				405-420	0003	0821
420-435	0010	8433				420-435	0004	0888
435-450	0010	8561				435-450	0002	0958
450-465	0009	8673				450-465	0003	0998
465-480	0020	8825				465-480	0003	1023
480-495	0015	9218				480-495	0004	1044
495-510	0011	9308				495-510	0001	1067
510-525	0005	9341				510-525	0001	1072
525-540	0008	9401				525-540	0000	1072
540-555	0014	9490				540-555	0000	1072
555-570	0007	9548				555-570	0004	1102
570-585	0005	9584						
585-600	0002	9596						
600-615	0002	9618						

Although a number of casualties went through the company area, there was no formal treatment at this point. Of the 314 casualties that were processed through the company area, treatment was reported for 20.

Table 4-9

TREATMENT TIMES, COMPANY AREA

Minimum treatment time:	2	minutes
Maximum treatment time:	24	minutes
Average treatment time:	9.35	minutes

Total treatment time for the 20 casualties: 187 minutes.

The cumulative information is useful to help determine the number of medical personnel required and the extent of their overload and slack time. Figure 4-9 illustrates the point. Assume that a doctor can reasonably spend 3/4 of an hour out of every hour rendering treatment to casualties. The graph shows that two doctors assigned to treat casualties whose cumulative treatment time per time is represented, will have slack time for the first hour, then will be overloaded for the next three hours. The casualty queue is finally eliminated, but during this time casualty treatment must be delayed. The dotted line shows that the number of doctors that must be assigned to prevent any delay in treatment is three.

Note that not only are the doctors' continued treatment capability per hour assumed, but so too are the linear aspect of their efforts. The intent is purely illustrative of the type of information that may be deduced here.

The distribution of treatment times reflects the types of casualties that have been sustained and may be directly related to the performance chart in Sec. V of this report.

One further statistic of interest is the use of the time that aid men spend in the field. From the arrival of an ambulance at its first field casualty until the time that it leaves the field with its casualty load, a certain time $\tau(\text{hrs})$ is consumed. During this time, $\sigma(\text{hrs})$ is

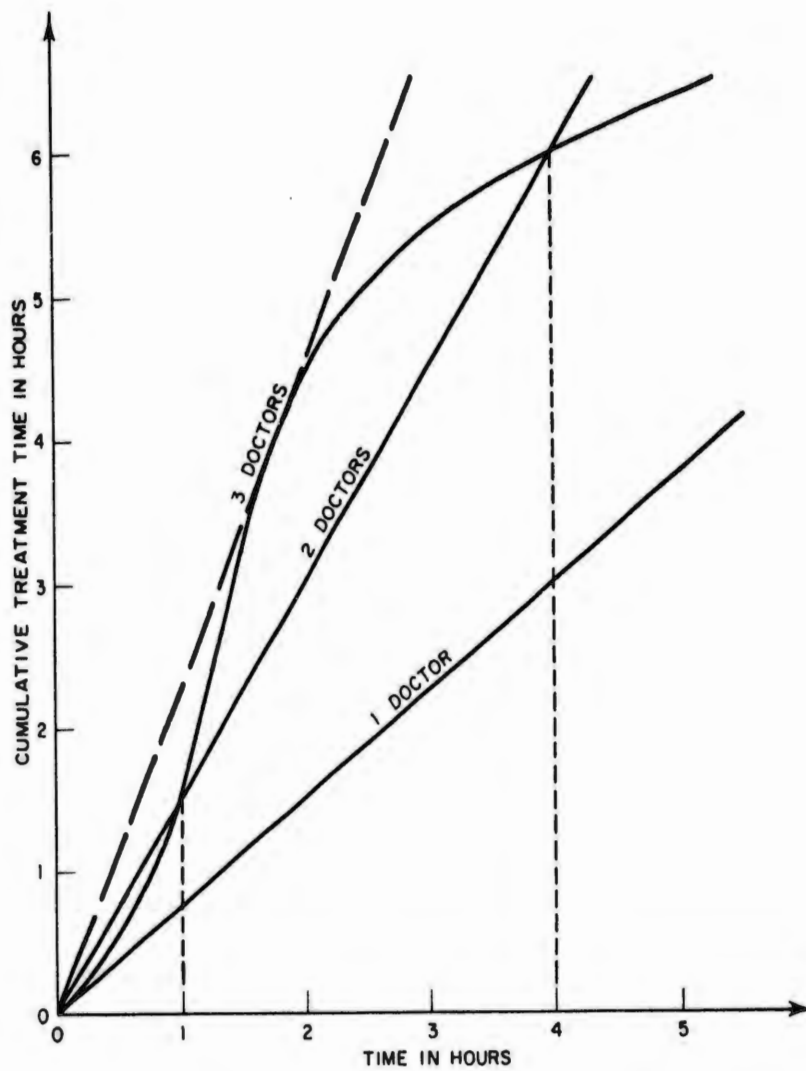


FIG. 4-9 MEDICAL PERSONNEL LOAD - ILLUSTRATIVE

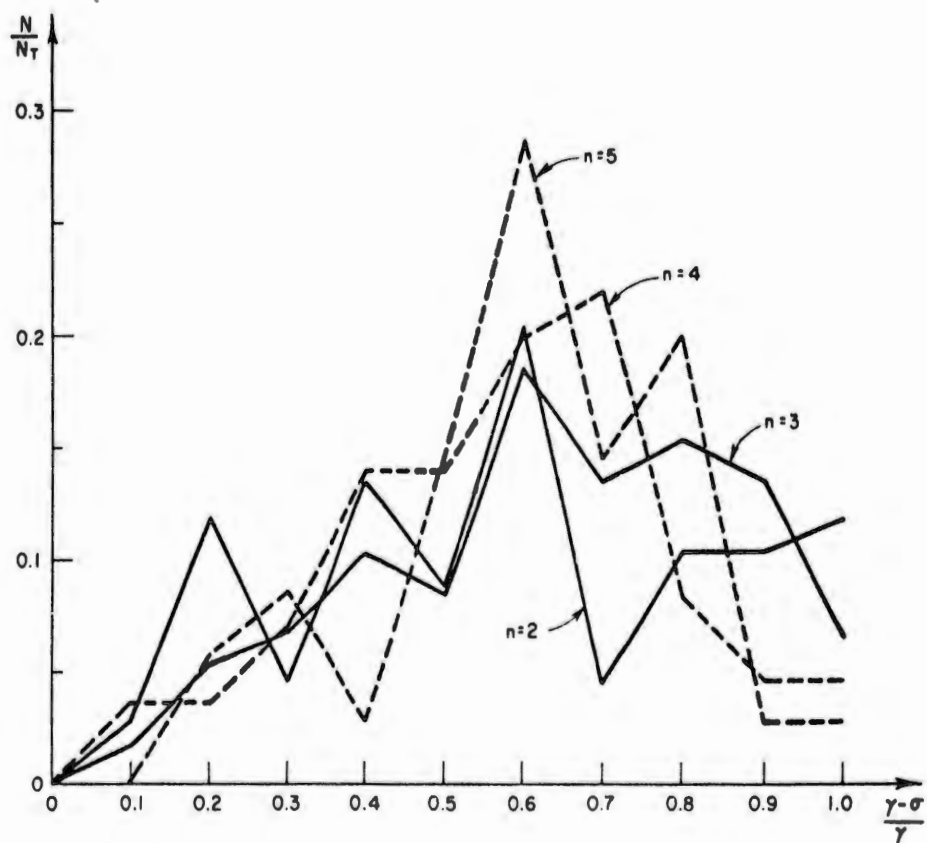
the sum of contiguous times spent treating casualties. Then $(\tau-\sigma)$, as a distribution against time for all ambulance field trips, yields what may be called the ambulance search time.

If n casualties are treated on one field trip, the search times must be independently studied for the difference values of n , i.e., $n = 2, 3, \dots, 8$. For $n = 1$, by the definitions of τ and σ as chosen, the search time should be small (see Tables 2-6, 3-4). The search time distributions are graphed parametrically for $n = 2, 3, 4$, and 5 in Fig. 4-10, based on the data that is tabulated in Table 4-10.

Table 4-10
AMBULANCE SEARCH TIME IN THE FIELD

$\frac{\tau-\sigma}{\tau}$	Number of Casualties Treated					
	1	2	3	4	5	6
	Number of Ambulances					
.0-.1	4	2	1	3	0	1
.1-.2	7	8	3	3	2	1
.2-.3	7	3	4	6	3	2
.3-.4	6	9	6	12	1	2
.4-.5	5	6	5	12	5	1
.5-.6	2	14	11	17	10	3
.6-.7	3	3	8	18	5	2
.7-.8	3	7	9	7	7	1
.8-.9	0	7	8	4	1	1
.9-1.0	3	8	4	4	1	0
Total No. Ambulance	40	67	59	86	35	14

The $(\tau-\sigma)$ search time value is somewhat ambiguous. Since σ is the sum of contiguous treatment times, it does not reflect the total number of treatment man hours. Normally, two aid men are assigned to an ambulance, and the driver too is able to give medical aid. Thus, it is conceivable that three casualties may be treated simultaneously or several aid men may attend one casualty together. Correspondingly,



N_T = TOTAL NO. OF AMBULANCE TRIPS WITH n CASUALTIES

N = NO. OF AMBULANCE TRIPS WITH n CASUALTIES HAVING
SEARCH TIME RATIO $(\gamma - \sigma)/\gamma$

FIG. 4-10 AMBULANCE SEARCH TIME IN THE FIELD

τ represents ambulance time in the field. The ambulance treatment capabilities are more closely approximated by a value between τ and 3τ .

V MEDICAL PERFORMANCE

In the Phase III, Spring 1960 experiment, the casualties were typed upon generation by indication of symptoms. Part of the simulated realism consisted of diagnosis, triage, and appropriate treatment predicated on the symptoms. Casualties were divided into Immediate, Emergency, and Delayed categories consisting respectively of 15, 25, and 35 types.⁴ The diagnostic procedures and the expected times of treatment are referred to in Table II of Ref. 1.

No medical diagnostic information was recorded, but extent of treatment times were recorded. Table 5-1 essentially duplicates the Table II referred to above, using actual treatment times in the field and at the aid station. For each class-type the sample size is listed. For each collected statistic, the sample size upon which it is based is also recorded. Because of omissions and other errors, these two sample sizes may differ. The statistics on treatment times are the minimum, maximum, and average treatment times for the group.

In addition, columns have been appended to the table to indicate the delays suffered by the casualty as he was processed through the medical system. Thus, the time delay before initial arrival of an ambulance is listed. So too are the times for the casualty to reach the aid station. If the casualty was processed through the company area an indication of this delay is detailed. As was demonstrated in Table 4-5, treatment at the company being unauthorized, was minor, and has been omitted from Table 5-1 as a relevant or significant statistic.

One class of recorded information that has not been statistically analyzed in this report is the rank of the individuals performing treatment. In the field and at the aid station, these personnel, for the most part, were enlisted men. It would seem that a reasonable correlation may exist between effectiveness of treatment and experience of the person involved. But it was felt that this had little relation to

rank. Hence, it was decided to defer such an analysis, in the spirit of General F. W. Gibb, who on the occasion of being faced with a similar situation to compare Majors versus Captains in an experimental environment, remarked, "If the Majors win, I'll promote all of my Captains."

TABLE 5-1

MEDICAL PERFORMANCE BY CASUALTY TYPE

BATTLEFIELD										COMPANY AREA										AID STATION									
TYPE	TOTAL NO CAS.	HMB ARRIVAL AT CAS. (AT FROM OCCURRENCE)				TOTAL TREATMENT TIME (MINUTES)				CASUALTY ARRIVAL (AT FROM OCCURRENCE)				CASUALTY DEPARTURE (AT FROM OCCURRENCE)				CASUALTY ARRIVAL (AT FROM OCCURRENCE)				TOTAL TREATMENT TIME (MINUTES)							
		NO.	MIN.	MAX.	AVG.	NO.	MIN.	MAX.	AVG.	NO.	MIN.	MAX.	AVG.	NO.	MIN.	MAX.	AVG.	NO.	MIN.	MAX.	AVG.	NO.	MIN.	MAX.	AVG.				
IMMEDIATE	1	13	11	000	205	98.1	13	002	013	7.0	03	030	119	78.3	03	051	146	96.3	12	075	353	161.0	06	010	018	14.0			
	2	10	18	007	315	96.1	17	007	015	8.7	03	051	210	117.4	03	056	264	138.3	17	047	383	186.8	08	005	016	10.2			
	3	19	01	001	197	48.3	19	004	023	16.1	02	042	043	42.5	02	064	071	67.5	19	068	276	130.5	16	008	035	13.0			
	4	16	15	006	242	72.5	16	002	021	5.1	02	059	089	74.0	02	059	093	76.0	15	045	261	124.3	11	002	020	9.0			
	5	20	18	005	096	37.4	19	003	013	7.5	01	089	089	89.0	01	118	118	118.0	18	054	205	115.6	15	002	020	12.6			
	6	13	15	003	209	73.4	13	004	012	6.4	01	071	071	71.0	02	080	142	111.0	10	055	289	137.1	04	010	030	18.7			
	7	11	10	018	405	126.6	11	005	014	5.9	02	075	136	105.5	02	080	142	111.0	10	087	525	194.3	05	004	016	8.4			
	8	15	14	003	425	102.7	15	002	010	4.4	03	063	067	65.3	02	074	080	77.0	14	074	465	168.3	10	002	020	10.1			
	9	17	17	006	233	56.4	16	002	071	9.1	02	043	069	56.0	02	071	116	93.5	16	047	298	127.0	11	005	017	11.9			
	10	15	14	012	222	88.4	15	002	019	6.9	01	127	127	127.0	01	330	330	330.0	13	050	357	132.6	11	007	018	12.3			
	11	17	16	005	338	96.2	16	002	009	4.1	04	036	212	96.7	03	056	218	111.0	16	057	391	148.7	13	002	019	10.0			
	12	12	10	012	170	65.4	12	005	015	9.0	02	076	085	80.5	02	080	087	83.5	12	042	237	135.6	06	005	014	10.1			
	13	14	11	005	250	57.3	13	003	019	9.1	02	043	069	56.0	02	051	078	64.5	13	061	312	137.7	11	007	020	12.9			
	14	15	15	006	248	61.8	15	002	033	12.7	02	043	069	56.0	02	051	078	64.5	15	059	385	147.4	11	004	026	10.5			
	15	13	11	000	213	58.6	13	002	013	6.6	02	085	116	100.5	02	088	133	110.5	13	058	390	147.7	10	007	045	14.9			
EMERGENCY	1	17	17	006	192	52.1	17	001	012	5.4	05	026	104	56.8	05	050	298	123.4	17	058	331	134.6	16	004	015	9.8			
	2	15	14	004	197	41.7	15	002	010	3.8	08	016	104	51.0	07	048	412	119.1	15	068	443	139.0	14	004	038	10.4			
	3	16	16	004	243	74.8	16	001	007	3.3	09	018	263	87.1	09	028	264	139.4	16	053	353	204.1	16	003	033	9.3			
	4	17	15	019	490	152.4	17	001	009	2.8	05	056	315	126.4	05	115	483	245.2	16	055	510	219.8	15	004	020	11.5			
	5	14	13	006	465	127.8	14	002	011	6.6	03	037	329	147.1	03	065	401	182.6	12	098	427	186.4	11	001	015	8.7			
	6	16	16	011	338	68.0	16	002	006	3.6	05	042	116	74.0	05	059	154	100.8	16	054	429	152.0	16	003	015	8.1			
	7	16	15	003	289	108.9	16	002	025	8.0	03	103	209	144.0	03	120	315	185.6	16	053	340	182.7	15	005	029	11.6			
	8	10	10	007	338	99.7	10	004	011	6.7	02	068	157	112.5	02	074	163	118.5	10	082	391	186.8	10	006	015	10.0			
	9	13	11	011	222	76.3	13	002	013	6.7	02	042	159	100.5	02	147	233	190.5	13	060	280	175.6	13	002	018	8.8			
	10	15	15	001	273	79.0	15	007	037	18.1	03	064	125	102.0	02	070	140	105.0	14	100	357	171.7	10	002	021	9.4			
	11	14	13	015	138	87.0	14	008	035	17.0	01	066	666	66.0	01	136	136	136.0	14	053	428	184.5	13	003	014	7.0			
	12	17	16	003	138	91.1	16	003	014	7.3	03	040	240	111.6	02	045	057	51.0	15	077	430	157.4	12	005	024	15.0			
	13	15	15	006	185	80.0	15	002	007	4.2	09	020	218	107.3	09	087	442	216.8	15	085	470	217.4	13	006	019	10.6			
	14	14	13	015	267	107.8	14	002	009	3.7	06	019	249	89.5	06	064	360	161.0	14	072	388	189.7	14	004	020	10.6			
	15	14	13	003	285	87.6	14	002	011	5.7	05	046	202	114.6	04	074	219	143.7	13	088	353	168.0	12	006	021	14.0			
	16	11	11	013	213	99.7	11	002	012	5.9	02	024	113	68.5	02	075	352	188.5	11	053	383	219.7	10	004	011	8.2			
	17	11	11	006	425	83.4	11	007	023	13.2	02	047	125	86.0	02	075	136	105.5	11	093	459	171.0	10	002	022	12.0			
	18	13	13	001	160	46.3	13	003	015	7.0	01	030	159	80.1	03	050	164	96.3	13	060	191	109.6	12	007	020	12.1			
	19	11	10	040	425	178.1	09	005	011	8.2	01	054	054	54.0	01	076	076	76.0	13	060	191	109.6	12	007	020	12.1			
	20	14	13	013	310	101.3	14	003	014	9.0	01	054	054	54.0	01	076	076	76.0	14	068	383	175.0	11	002	020	11.8			
	21	14	14	004	127	30.5	14	001	030	6.1	01	032	085	50.6	03	082	120	104.3	14	045	225	116.5	14	004	030	10.0			
	22	14	14	007	280	96.2	14	001	009	4.5	02	058	078	68.0	03	030	121	70.0	13	060	379	146.7	11	001	017	7.8			
	23	18	18	002	266	81.6	18	003	020	10.3	01	240	240	240.0	02	170	186	178.0	17	046	297	148.7	17	002	032	10.6			
	24	13	12	025	222	93.2	13	004	013	7.1	02	169	181	175.0	02	170	186	178.0	13	086	287	160.9	12	001	020	9.0			
	25	10	10	012	180	56.1	10	001	007	3.6	02	045	076	60.5	02	041	507	429.0	10	047	534	239.2	08	002	020	9.1			
DELAYED	1	13	13	022	177	97.4	13	003	014	7.3	03	114	185	139.3	03	188	239	219.6	13	092	281	193.8	13	003	021	11.4			
	2	10	10	000	135	42.0	10	005	020	10.8	06	042	161	83.6	05	107	253	185.6	10	086	276	173.9	09	003	019	9.4			
	3	12	11	005	167	60.0	12	001	008	4.9	07	037	181	84.4	07	106	327	234.4	12	105	567	240.0	12	002	008	4.9			
	4	10	10	005	110	45.3	17	001	013	4.9	07	040	164	78.7	07	071	378	206.2	10	054	417	166.1	18	001	018	8.6			
	5	16	16	005	275	77.3	15	002	009	4.3	04	045	090	67.5	03	176	408	255.3	16	072	447	191.8	15	002	025	7.3			
	6	10	10	005	130	40.6	10	002	011	4.8	08	026	154	90.8	08	086	279	167.1	10	039	310	167.8	10	002	018	9.1			
	7	13	12	009	220	79.2	13	002	015	6.7	05	025	126	54.0	05	050	393	234.8	13	079	425	215.8	13	004	035	12.4			
	8	12	12	004	249	83.4	11	002	011	6.0	05	030	277	110.6	05	061	307	171.4	12	083	414	221.7	12	003	020	9.0			
	9	15	15	006	173	55.1	15	001	006	3.4	09	040	223	100.2	09	071	359	212.6	15	070	380	201.2	13	003	010	5.9			
	10	14	14	000	338	75.7	13	003	027	10.0	04	038	110	80.0	04	147	248	180.5	14	070	430	195.7	14	001	022	9.4			
	11	13	14	008	167	60.8	15	005	042	12.4	06	054	140	90.8	05	095	381	221.0	15	055	414	200.0	15	003	015	8.8			
	12	16	14	004	275	60.2	15	002	015	7.6	03	030	151	71.0	03	048	162	83.3	16	048	351	127.7	16	004	030	11.7			
	13	15	15	009	471	114.9	14	001	007	2.7	06	027	096	64.0	06	106	590	270.1	15	075	558	263.6	12	003	016	7.6			
	14	15	15	000	233	68.5	13	001	008</																				

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