APPENDIX A

Methods of Computation

The computations underlying the factors given in tables 90–93 are based on the accumulation of one patient per day for 30 days, then decumulation over time to zero. The remaining and disposition distributions are shown in tables C–1 and C–2 and provide the probabilities for patients remaining in hospital at specified points in time (R_i) as well as the probability of either return to duty or death, respectively (G_i), or of experiencing a disability separation (D_i), each as a function of time. The evacuee factors are given in tables C–3 and C–4 and provide the probability of evacuation by the end of each indicated day. The various accumulation-decumulation and disposition factors may be computed as follows:

Patients Remaining in Theater

To estimate the number of patients remaining in theater, under the assumption of one theater admission per day through the first period of estimate—then none, the following are defined:

d = number of days in the period of estimate,

d_i = last day of the *ith* period of estimate, that is, $d_i = i \times d$,

p = number of days in the theater evacuation policy, and note that the policy considers a patient's total hospital time in theater,

R_i = probability that a patient's total hospitalization anywhere will exceed i days (see tables C–1 and C–2),

D_i = probability that a patient will be separated for disability by the end of the *ith* day (see tables C–1 and C–2),

$E_{i,p}$ = probability that a patient will be evacuated by the end of the *ith* day under evacuation policy p (see tables C–3 and C–4), and note that $E_{p,p} = R_p + D_p$ which insures that all disability separations will occur in CONUS.

RO_i = number of patients remaining in overseas hospitals at the end of day i under the assumption of one theater admission per day through the first period of estimate (d_1)—then none.

Thus, *when* $p < d$

$$ROd_1 = \sum_{i=1}^{p} (R_i - E_{i,p}) \tag{1}$$

and, $ROd_j = 0$ for $j = 2, 3, 4, \cdots$.

When $p \geq d$, and defining $d_0 = 0$,

$$ROd_j = \sum_{i=d_{j-1}+1}^{d_j} (R_i - E_{i,p} + D_i) \tag{2}$$

for all j where $d_j \leq p$, and $ROd_j = 0$ for all j where $d_j > p$.

Patients Remaining in CONUS

To estimate the number of patients remaining in CONUS hospitals at the end of day i, under the assumption of one theater admission per day through the first period of estimate—then none.

When $p < d$,

$$RCd_1 = \sum_{i=p+1}^{d_1} R_i + \sum_{i=1}^{p} E_{i,p} \tag{3}$$

and,

$$RCd_j = \sum_{i=d_{j-1}+1}^{d_j} R_i \tag{4}$$

for $j = 2, 3, 4, \cdots$.

When $p \geq d$,

$$RCd_j = \sum_{i=d_{j-1}+1}^{d_j} (E_{i,p} - D_i) \tag{5}$$

for all j where $d_j < p$,
and, as in (4) above for all j where $d_j \geq p$.

Patients Evacuated From One Echelon to Another

To estimate patient evacuees between any two echelon system (Army-COMMZ, Theater-CONUS), where AEj is the number of evacuees during the j*th* period of estimate, under the assumption of one admission per day through the first period of estimate—then none. Note that the last patient evacuated must occur by the end of day $d+p-1$.

When $p<d$,

$$AE_1 = (d-p)E_{p,p} + \sum_{i=1}^{p} E_{i,p} \tag{6}$$

$$AE_2 = (p-1)E_{p,p} - \sum_{i=1}^{p-1} E_{i,p} \tag{7}$$

and $AE_j = 0$ for $j = 3, 4, 5, \cdots$.

When $p \geq d$,

$$AE_1 = \sum_{i=1}^{d_1} E_{i,p} \tag{8}$$

And,

$$AE_j = \sum_{i=d_{j-1}+1}^{d_j} (E_{i,p} - E_{i-d,p}) \tag{9}$$

for $d_1 < d_j \leq p$

$$AE_j = \sum_{i=d_{j-1}+1}^{p} (E_{i,p} - E_{i-d,p}) + (d_j - p)E_{p,p} - \sum_{i=p+1}^{d_j} E_{i-d,p} \tag{10}$$

for $p < d_j < p+d-1$

$$AE_j = (p+d-1-d_{j-1})E_{p,p} - \sum_{i=d_{j-1}+1}^{p+d-1} E_{i-d,p} \tag{11}$$

for $p+d-1 \leq d_j < p+2d-1$

and, $AE_j = 0$ for $d_j \geq p+2d-1$

Patients Returned to Duty in Theater

Where G_i is the probability that a patient anywhere will be returned to duty by the end of his i*th* day (see tables C–1 and C–2). And GO_j is the number of returns to duty in the overseas theater during the j*th* period of estimate, under the assumption of one theater admission per day through the first period of estimate—then none.

When $p<d$,

$$GO_1 = (d-p)G_p + \sum_{i=1}^{p} G_i \tag{12}$$

$$GO_2 = (p-1)G_{p,p} - \sum_{i=1}^{p-1} G_{i,p} \tag{13}$$

and $GO_j = 0$ for $J = 3, 4, 5, \cdots$.

When $p \geq d$,

$$GO_1 = \sum_{i=1}^{d_1} G_i \tag{14}$$

$$GO_j = \sum_{i=d_{j-1}+1}^{d_j} (G_i - G_{i-d}) \tag{15}$$

for $d_1 < d_j \leq p$

$$GO_j = \sum_{i=d_{j-1}+1}^{p} (G_i - G_{i-d}) + (d_j - p)G_p - \sum_{i=p+1}^{d_j} G_{i-d} \tag{16}$$

for $p < d_j < p+d-1$

$$GO_j = (p+d-1-d_{j-1})G_p - \sum_{i=d_{j-1}+1}^{p+d-1} G_{i-d} \tag{17}$$

for $p+d-1 \leq d_j < p+2d-1$

and, $GO_j = 0$ for $d_j \geq p+2d-1$.

Patients Returned to Duty in CONUS

Where GC_j is the number of returns to duty in CONUS during the *jth* period of estimate, under the assumption of one theater admission per day through the first period of estimate—then none. Note that no returns to duty occur in CONUS through day p. In general,

$$GC_j = \left(\sum_{i=d_{j-1}+1}^{d_j} G_i \right) - GO_j \tag{18}$$

for $j = 1, 2, 3, \cdots$.

Hospital Deaths, Theater and CONUS

The formulas in (12) through (18) apply to deaths as well, where G_i is the probability of a death occurring in hospital anywhere by the end of the *ith* day (see tables C–1 and C–2). Also GO_j and GC_j are defined as the number of deaths occurring in hospitals overseas or in CONUS, respectively, during the *jth* period of estimate, under the foregoing assumptions leading to (12) through (18).

Disability Separations in CONUS

Where DC_j is the number of disability separations occurring in CONUS during the *jth* period of estimate, under the assumption of one theater admission per day through, the first period of estimate—then none. Note that since $E_{p,p} = Rp + Dp$, all disability separations occur in CONUS; that is, a potential disability separation is always evacuated before separation.
Then,

$$DC_j = \sum_{i=d_{j-1}+1}^{d_j} D_i \tag{19}$$

for $j = 1, 2, 3, \cdots$.

Changing Evacuation Policies

Where the length of the evacuation policy p is changed to p′, usually at a time d_k coincident to the end of a period of estimate, and $d_k \geq d+p-1$, no changes occur. Otherwise, when h is that period where $p+d-1 \leq d_h < p+2d-1$, and when h′ is that period where $p'+d-1 \leq d_{h'} < p'+2d-1$ for $d_h = d_{h+1}, d_{h+2} \cdots, d_{h'}$

When $p < p'$

$$AE_j(\text{new}) = \frac{Rp'}{Rp} \sum_{i=k+1}^{h} AE_i(\text{old}) \frac{AE_j(p')}{\sum_{i=k+1}^{h'} AE_i(p')} \tag{20}$$

$$GO_j(\text{new}) = \delta_j GO_j(\text{old}) + \left[1 - \frac{Rp'}{Rp}\right] \sum_{i=k+1}^{h} AE_i(\text{old}) \frac{GO_j(p') - \delta_j GO_j(\text{old})}{[\sum_{i=h+1}^{h'} GO_i(p')] - \sum_{i=k+1}^{h} GO_i(\text{old})} \tag{21}$$

$\delta = 1$ for $j = k+1, \cdots, h$ and 0 for $j = h+1 \cdots, h'$.

When $p > p'$

$$AE_j(\text{new}) = AE_j(\text{old}) + \left[1 - \frac{Gp'}{Gp}\right] \sum_{i=k+1}^{h} GO_i(\text{old}) \frac{AE_j(p')}{\sum_{i=k+1}^{h'} AE_i(p')} \tag{22}$$

$$GO_j(\text{new}) = GO_{j,p'} \tag{23}$$

Applicability

The accumulation-decumulation factors obtained from the preceding sections are applicable only to the respective admissions, by type, which have occurred at a constant average daily rate for a particular period of estimate. Thus, in practice, periods of estimate cover only those consecutive days which can be expected to experience approximately the same average number of daily admissions. By simply multiplying these daily admissions by the respective factors, the expected accumulations and dispositions of patients may be obtained for a given period of estimate. It should be noted that these factors permit following an admission group to final disposition.

The computations, therefore, must be repeated for each separate group of admissions during succeeding periods of estimate and the results aggregated in the appropriate fashion. In addition, the entire process must be done separately for wounded and disease and nonbattle injury patients.