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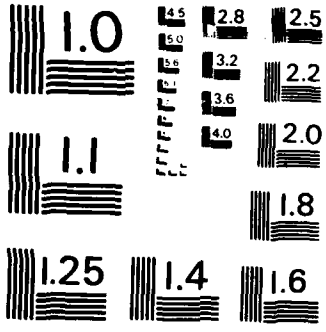


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# report

CR-182

# Documentation of the Tactical Vehicle Fleet Simulation Model

VOLUME I – EXECUTIVE SUMMARY

By

Lawrence D. Koenig
Paul S. Souder, Jr.
George O. Swanson

Prepared for:

Department of the Army
U.S. Army Logistics Center
Fort Lee, Virginia

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Contract No. DAAG39-77-C-0066

June 1977

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# EXECUTIVE SUMMARY

## PURPOSE AND SCOPE

This documentation of the Tactical Vehicle Fleet Simulation (TVFS) model was conducted by General Research Corporation (GRC) in an effort to provide the U.S. Army Logistics Center the necessary information for implementing and running the TVFS model. The documentation consists of three volumes: this summary for executives, a programmer-analyst manual, and a planner-user manual. As another task within this contract, GRC provided a computer tape of the model's source code written in FTN-Extended FORTRAN, compatible with the Control Data Corporation computer system located at Ft. Leavenworth, Kansas.

Two training sessions were also conducted at Ft. Lee, Virginia, to familiarize the personnel at that facility with the logic and operation of the model. The sessions also provided the framework for future implementation of the model on studies in which the Logistics Center may wish to incorporate a model with the capabilities inherent in the TVFS.

## GENERAL DESCRIPTION AND CAPABILITIES OF THE MODEL

The TVFS model is a computerized stochastic representation of vehicle fleet operations. It can also be described as a discrete event queuing and service model which generates events, such as mission and maintenance actions, according to prescribed statistical distributions. Figure 1 demonstrates the major simulation functions and shows the activities that occur during one time increment of simulated fleet operations. Based on the generation of mission demands, the model loads, transmits, unloads, returns, and maintains vehicles over time. The model withdraws vehicles from the fleet at appropriate (random and/or deterministic) times, for scheduled and random periods, according to a specified pattern.

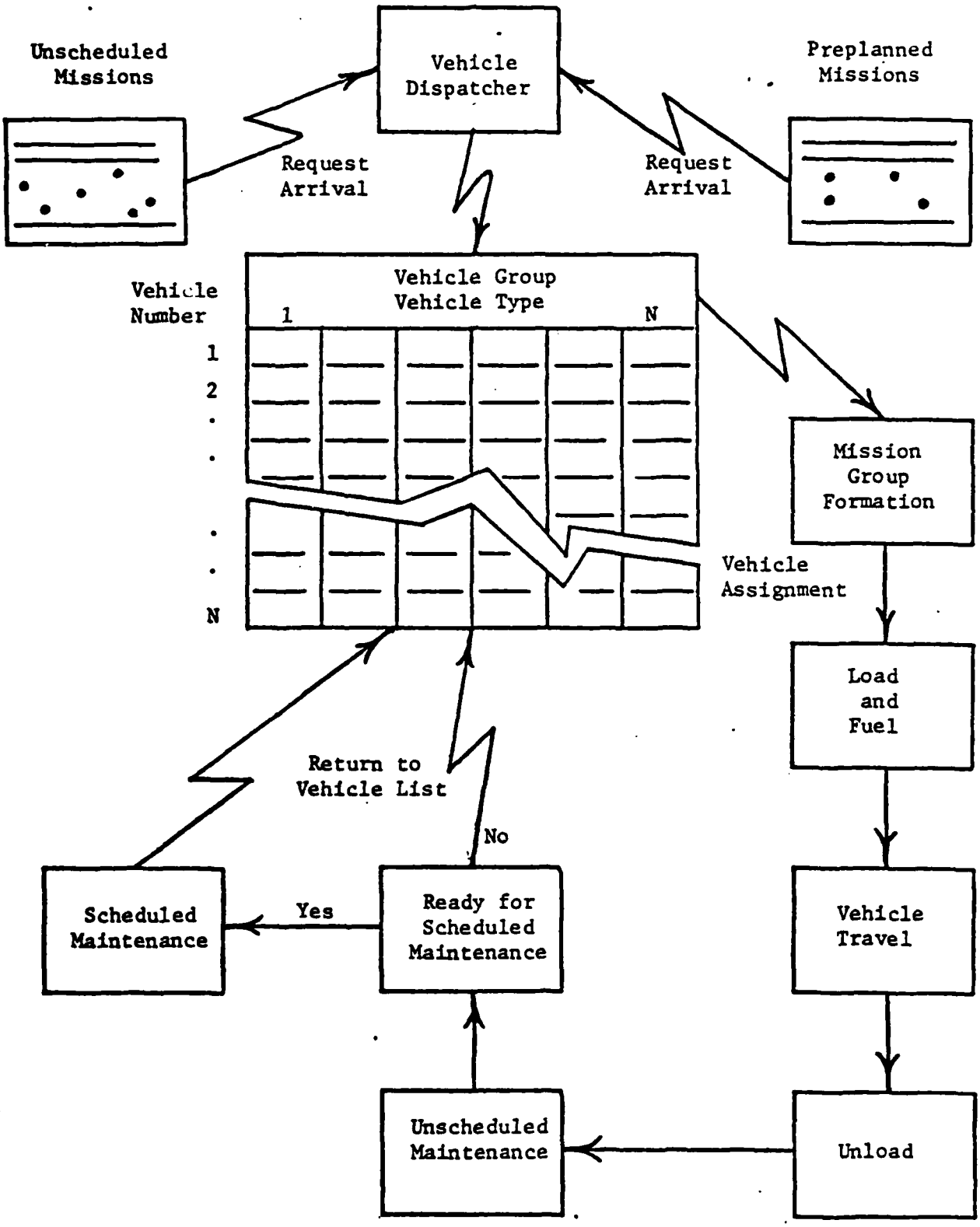


Figure 1—TVFS Simulation Schematic

The model lends itself to the evaluation of alternative compositions of vehicle fleets and allows the evaluation of the operational procedures for assigning vehicles to missions and numerically represents the effect of different mission demands on fleet performance.

The model operates by stepping through a series of missions, assigning vehicles to each mission, while keeping track of the total operating time for each vehicle, delays due to unavailability of vehicles, and other various measures of performance.

The model operates with several types of vehicles simultaneously, simulating the performance of a given fleet on a given mission pattern over a specified period of time. Alternative fleet sizes and compositions can be run successively to compare their performance.

The model has been applied to several studies for which it demonstrated its capabilities to simulate the effectiveness of given fleet mixes against a set of demands for services. These applications ranged from modeling the support and attack characteristics of a helicopter fleet to assessing the comparative performance or alternative fleets composed of standard and high mobility vehicles.

## BASIC ASSUMPTIONS AND LIMITATIONS

The following assumptions deal with the types of statistical distributions used, order of processing events, and general tie-breaking rules:

1. The model represents mission requests as a compound Poisson process, or equivalently, as a simple Poisson process for each type of mission that operates independently.

2. Missions can be specified such that requests are honored on a first-come, first-served basis within each of three allowable priority classes.

3. Downtimes can be represented as a combination of scheduled maintenance times based on accumulated operating hours, randomly distributed unscheduled maintenance times required after some randomly chosen missions, and other non-transit times corresponding to load/unload/checklist/crew change times which are fixed for given vehicle and mission combinations.

Within these assumptions, the model has been designed to use random number generators to supply stochastic events, while all other required information can be furnished as input.

Certain factors surrounding vehicle fleet operations have been fixed relative to the model's code and, therefore, are not applicable to the type of problem which the model addresses. These factors are not to be confused with limitations of the model; rather, they are constraints which were initially designed into the model in order to allow fleet utilization to be studied without interaction with other elements of fleet operations. These areas are:

1. The model does not allow for vehicle attrition due to combat loss, accidents, irreparable breakdown, etc. The limitation can be judged to be small if one assumes that most attrited vehicles are replaced from ready area reserve pools.

2. Forward resupply missions are performed by vehicles traveling directly from some specified rear area supply point to the forward requesting unit without transloading or other delays at intermediate points along the route.

3. The model makes no attempt to keep track of stock levels at either forward unit locations or rear area supply points.

4. Vehicle payload characteristics are stated as a tonnage and therefore do not allow vehicles to "cube-out" due to large volume cargo prior to reaching their tonnage capacity.

## INPUT DATA REQUIREMENTS

All input data to the model appear in 80-column card image, with the different input data types assigned to various files. The model requires three basic types of input data which establish the environment in which the model will operate. The following list of data requirements will demonstrate the type of data which must be provided for execution of the model.

Mission Related

- Unit designations
- Type and priority of missions
- Mission tonnages
- Travel time to unit locations
- Allowable vehicle type(s) and preferences
- Load and unload factors

Vehicle Related

- Payload
- Operating speed
- Maintenance history
- Scheduled maintenance interval and duration
- Unscheduled maintenance interval and duration distributions

Simulation Related

- Length of simulation (days)
- Mission request start/finish times
- Vehicle assignment start/finish times
- Workday start/finish times
- Vehicle assignment discipline
- Mission cancel or day-to-day carryover parameters

Of the four input files required for execution, the first (TAPE1) contains information on preplanned missions, that is, missions which are known to occur on a regular basis during the course of the simulation period.

The second file (TAPE3) deals with unit resupply information consisting of the following:

- Standard Requirement Code (SRC) number
- Unit designation
- Universal Transverse Mercator grid coordinates
- Resupply tonnage for each mission type (ammunition, POL, general supply, etc.)

The third file (TAPE4) contains travel time data and distances between the supply points and the SRC units. The data in this file are as follows:

- SRC unit number
- Distance from unit to supply point
- One-way travel time for each vehicle type allowed in a given simulation

The last file (TAPE5) contains all of the simulation control parameters and consists of 49 different card types which further describe the model's operating environment. These card types are of a free-field format which allows great flexibility in the structuring of the input data.

## OUTPUT RESULTS

The TVFS model provides a comprehensive listing of results for each simulation day, as well as summary reports of vehicle and mission activity across the entire simulation period. Upon completion of input data validation, the model provides reports dealing with the input data such as: current program maximums list, travel time/vehicle type matrix, SRC unit location tableau, vehicle preference table, and scheduled maintenance intervals and durations.

Following these reports, simulation statistics appear in report form which describe information concerning mission requests; completions and delays; vehicle-related times for maintenance, loading, unloading, operation, administration, and waiting

Figures 2 and 3 represent the type of report which the model generates for each simulated day.

## RESOURCES REQUIRED FOR MODEL APPLICATION

The TVFS model requires detailed vehicle and mission related data, linked to the model by simulation control parameters. The structuring of the problem to be modelled into a form which the model can use requires a coordinated and effective data collection and assembly effort. For this reason, a study team consisting of functional representatives familiar with all facets of tactical and logistical vehicle fleet simulation is imperative. The multitude of vehicle fleet problems which the model is capable of simulating and the diversity of the data required to satisfy the input requirements make defining the skills of the study team a function of the problem being modelled, not the model itself. In almost all applications of the model, however, an analyst's skills would be necessary for problem definition and structuring as well as for ensuring a smooth and efficient job of data assimilation. An analyst's skills would also be required for model output analysis and evaluation. In general, the project director and/or coordinator must possess analytic skills typically associated with position titles such as operations research analyst, systems analyst, etc. These individuals must possess a total knowledge of the problem under study in order to guide other study personnel.

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2 DAY RUN 4 HOUR DAY

| DAY | PD-AND VEH TYP | TOTAL MSNS REQ-D | TOTAL MSNS COM-D | MSNS COM-D TODAY | TOTAL MSNS DEL-D | MSNS DEL-D TODAY | TOTAL DELAY TIME (HRS) | DELAY TIME TODAY (HRS) | AVG DELAY COM-D MSNS (HRS) | AVG DELAY DEL-D MSNS (HRS) | VEHS USED TODAY | TOTAL OPER TIME (HRS) | TOTAL NON-OP TIME (HRS) | TOTAL S Y | TOTAL U S H TIME (HRS) | TOTAL LOAD TIME (HRS) | TOTAL UNLD TIME (HRS) | TOTAL ADMIN TIME (HRS) | TOTAL GROUP WAIT TIME (HRS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 41 | 34. | 14. | 0 | 0 | 0. | 0.0 | 0.0 | 0.0 | 15 | 42. | 6. | 3. | 0. | 4. | 10. | 12. | 0. |
| | 2 | 21 | 21. | 21. | 0 | 0 | 0. | 0.0 | 0.0 | 0.0 | 23 | 32. | 19. | 0. | 2. | 8. | 9. | 10. | 0. |
| | 3 | 0 | 0. | 0. | 0 | 0 | 0. | 0.0 | 0.0 | 0.0 | 12 | 57. | 10. | 3. | 0. | 2. | 2. | 9. | 0. |
| | 4 | | | | | | | | | | 10 | 46. | 2. | 0. | 1. | 2. | 2. | 8. | 0. |
| | 5 | | | | | | | | | | 8 | 43. | 18. | 0. | 5. | 1. | 1. | 7. | 0. |
| | 6 | | | | | | | | | | 0 | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| | 7 | | | | | | | | | | 14 | 42. | 26. | 0. | 2. | 3. | 3. | 8. | 0. |
| | 8 | | | | | | | | | | 5 | 14. | 14. | 0. | 0. | 2. | 2. | 4. | 0. |
| | 9 | | | | | | | | | | 0 | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| | 10 | | | | | | | | | | 0 | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| | 11 | | | | | | | | | | 0 | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| | 12 | | | | | | | | | | 0 | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| POOL MOVED TO 470/100 ON DAY 2 X-CENTER +100.0 KM, WHEN IT LAGS X-CENTER BY 1.0 KM --- X-CENTER= 370.2 Y-CENTER= 101.0 | | | | | | | | | | | | | | | | | | | |
| 2 | 1 | 82 | 68. | 34. | 0 | 0 | 0. | 0.0 | 0.0 | 0.0 | 15 | 95. | 14. | 0. | 1. | 7. | 18. | 22. | 0. |
| | 2 | 42 | 42. | 21. | 0 | 0 | 0. | 0.0 | 0.0 | 0.0 | 19 | 150. | 31. | 0. | 6. | 14. | 15. | 30. | 0. |
| | 3 | 0 | 0. | 0. | 0 | 0 | 0. | 0.0 | 0.0 | 0.0 | 9 | 100. | 20. | 3. | 14. | 4. | 4. | 16. | 0. |
| | 4 | | | | | | | | | | 7 | 77. | 9. | 0. | 1. | 3. | 3. | 14. | 0. |
| | 5 | | | | | | | | | | 1 | 49. | 23. | 0. | 5. | 2. | 2. | 8. | 0. |
| | 6 | | | | | | | | | | 12 | 50. | 60. | 0. | 3. | 3. | 3. | 11. | 0. |
| | 7 | | | | | | | | | | 4 | 49. | 46. | 0. | 2. | 4. | 4. | 10. | 0. |
| | 8 | | | | | | | | | | 9 | 33. | 55. | 0. | 0. | 6. | 6. | 11. | 0. |
| | 9 | | | | | | | | | | 0 | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| | 10 | | | | | | | | | | 3 | 11. | 17. | 0. | 4. | 1. | 1. | 3. | 0. |
| | 11 | | | | | | | | | | 0 | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| | 12 | | | | | | | | | | 0 | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |

| VEH-ICLE TYPE | VEH-ICLES AVAIL-ABLE | VEH-ICLES UTIL-IZED | AVG. NO. UTIL-IZED | STD. DEV. NO. UTIL-IZED | OPER-ATING TIME (HRS) | OPER-ATING TIME PCT. | NON-OP TIME (HRS) | NON-OP TIME PCT. | SCHED-ULED MAINT-ENANCE TIME (HRS) | UN-SCHED-ULED MAINT-ENANCE TIME (HRS) | MAINT-ENANCE TIME PCT. | TURNAROUND LOAD/UNLOAD TIME (HRS) | TURNAROUND LOAD/UNLOAD TIME PCT. | GROUP-FORMING WAITING TIME (HRS) | AVERAGE VEHICLE TIME (DAYS) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 15 | 15. | 15.0 | 0.00 | 95. | 60.5 | 14. | 8.8 | 0. | 1. | .6 | 47. | 30.1 | 0.0 | 2.60 |
| 2 | 23 | 23. | 21.0 | 2.83 | 150. | 61.1 | 31. | 12.7 | 0. | 6. | 2.4 | 59. | 23.9 | 0.0 | 2.66 |
| 3 | 12 | 12. | 10.5 | 2.12 | 100. | 63.8 | 20. | 12.8 | 0. | 14. | 8.9 | 23. | 14.5 | 0.0 | 3.27 |
| 4 | 10 | 10. | 8.5 | 2.12 | 77. | 72.5 | 9. | 8.8 | 0. | 1. | .9 | 19. | 17.8 | 0.0 | 2.66 |
| 5 | 9 | 9. | 4.5 | 4.95 | 49. | 55.7 | 23. | 26.0 | 0. | 5. | 5.5 | 11. | 12.7 | 0.0 | 2.42 |
| 6 | 12 | 12. | 6.0 | 8.49 | 50. | 41.6 | 60. | 43.4 | 0. | 3. | 2.3 | 18. | 12.6 | 0.0 | 2.89 |
| 7 | 14 | 14. | 9.0 | 7.07 | 49. | 43.1 | 46. | 39.9 | 0. | 2. | 1.5 | 18. | 15.6 | 0.0 | 2.04 |
| 8 | 13 | 13. | 7.0 | 2.83 | 33. | 29.5 | 55. | 49.8 | 0. | 0. | .4 | 23. | 20.3 | 0.0 | 2.14 |
| 10 | 20 | 3. | 1.5 | 2.12 | 11. | 28.9 | 17. | 46.5 | 0. | 4. | 41.1 | 5. | 13.4 | 0.0 | 3.12 |
| TOTAL | 128 | 111. | 87.0 | 5.66 | 620. | 53.8 | 275. | 23.9 | 0. | 36. | 3.2 | 221. | 19.2 | 0.0 | 2.60 |

Figure 2—Vehicle Utilization Report

FREQUENCIES OF MISSION COMPLETION TIMES IN INTERVALS OF 40 MINUTES ...

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UNIT MOVES

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/ | 0 | 2/ | 0 | 3/ | 0 | 4/ | 0 | 5/ | 0 | 6/ | 0 | 7/ | 0 | 8/ | 0 | 9/ | 0 | 10/ | 0 |
| 11/ | 0 | 12/ | 0 | 13/ | 0 | 14/ | 0 | 15/ | 0 | 16/ | 0 | 17/ | 0 | 18/ | 0 | 19/ | 0 | 20/ | 0 |
| 21/ | 0 | 22/ | 0 | 23/ | 0 | 24/ | 0 | 25/ | 0 | 26/ | 0 | 27/ | 0 | 28/ | 0 | 29/ | 0 | 30/ | 0 |
| 31/ | 0 | 32/ | 0 | 33/ | 0 | 34/ | 0 | 35/ | 0 | 36/ | 0 | 37/ | 0 | 38/ | 0 | 39/ | 0 | 40/ | 0 |

OTHER RESUPPLY

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/ | 0 | 2/ | 0 | 3/ | 79 | 4/ | 8 | 5/ | 9 | 6/ | 0 | 7/ | 0 | 8/ | 0 | 9/ | 0 | 10/ | 0 |
| 11/ | 0 | 12/ | 0 | 13/ | 0 | 14/ | 0 | 15/ | 0 | 16/ | 0 | 17/ | 0 | 18/ | 0 | 19/ | 0 | 20/ | 0 |
| 21/ | 0 | 22/ | 0 | 23/ | 0 | 24/ | 0 | 25/ | 0 | 26/ | 0 | 27/ | 0 | 28/ | 0 | 29/ | 0 | 30/ | 0 |
| 31/ | 0 | 32/ | 0 | 33/ | 0 | 34/ | 0 | 35/ | 0 | 36/ | 0 | 37/ | 0 | 38/ | 0 | 39/ | 0 | 40/ | 0 |

AMMO RESUPPLY

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/ | 0 | 2/ | 0 | 3/ | 9 | 4/ | 7 | 5/ | 15 | 6/ | 22 | 7/ | 10 | 8/ | 0 | 9/ | 0 | 10/ | 0 |
| 11/ | 0 | 12/ | 0 | 13/ | 0 | 14/ | 0 | 15/ | 0 | 16/ | 0 | 17/ | 0 | 18/ | 0 | 19/ | 0 | 20/ | 0 |
| 21/ | 0 | 22/ | 0 | 23/ | 0 | 24/ | 0 | 25/ | 0 | 26/ | 0 | 27/ | 0 | 28/ | 0 | 29/ | 0 | 30/ | 0 |
| 31/ | 0 | 32/ | 0 | 33/ | 0 | 34/ | 0 | 35/ | 0 | 36/ | 0 | 37/ | 0 | 38/ | 0 | 39/ | 0 | 40/ | 0 |

UNIT MOVES TOTAL= 0.0

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/ | 0/ | 0.00/ | 0.00 | 2/ | 0/ | 0.00/ | 0.00 | 3/ | 0/ | 0.00/ | 0.00 | 4/ | 0/ | 0.00/ | 0.00 | 5/ | 0/ | 0.00/ | 0.00 |
| 6/ | 0/ | 0.00/ | 0.00 | 7/ | 0/ | 0.00/ | 0.00 | 8/ | 0/ | 0.00/ | 0.00 | 9/ | 0/ | 0.00/ | 0.00 | 10/ | 0/ | 0.00/ | 0.00 |
| 11/ | 0/ | 0.00/ | 0.00 | 12/ | 0/ | 0.00/ | 0.00 | 13/ | 0/ | 0.00/ | 0.00 | 14/ | 0/ | 0.00/ | 0.00 | 15/ | 0/ | 0.00/ | 0.00 |
| 16/ | 0/ | 0.00/ | 0.00 | 17/ | 0/ | 0.00/ | 0.00 | 18/ | 0/ | 0.00/ | 0.00 | 19/ | 0/ | 0.00/ | 0.00 | 20/ | 0/ | 0.00/ | 0.00 |
| 21/ | 0/ | 0.00/ | 0.00 | 22/ | 0/ | 0.00/ | 0.00 | 23/ | 0/ | 0.00/ | 0.00 | 24/ | 0/ | 0.00/ | 0.00 | 25/ | 0/ | 0.00/ | 0.00 |
| 26/ | 0/ | 0.00/ | 0.00 | 27/ | 0/ | 0.00/ | 0.00 | 28/ | 0/ | 0.00/ | 0.00 | 29/ | 0/ | 0.00/ | 0.00 | 30/ | 0/ | 0.00/ | 0.00 |
| 31/ | 0/ | 0.00/ | 0.00 | 32/ | 0/ | 0.00/ | 0.00 | 33/ | 0/ | 0.00/ | 0.00 | 34/ | 0/ | 0.00/ | 0.00 | 35/ | 0/ | 0.00/ | 0.00 |
| 36/ | 0/ | 0.00/ | 0.00 | 37/ | 0/ | 0.00/ | 0.00 | 38/ | 0/ | 0.00/ | 0.00 | 39/ | 0/ | 0.00/ | 0.00 | 40/ | 0/ | 0.00/ | 0.00 |

OTHER RESUPPLY TOTAL= 56.0

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/ | 0/ | 0.00/ | 0.00 | 2/ | 0/ | 0.00/ | 0.00 | 3/ | 33/ | 69.64/ | 69.64 | 4/ | 9/ | 14.29/ | 83.93 | 5/ | 9/ | 16.07/ | 100.00 |
| 6/ | 0/ | 0.00/ | 100.00 | 7/ | 0/ | 0.00/ | 100.00 | 8/ | 0/ | 0.00/ | 100.00 | 9/ | 0/ | 0.00/ | 100.00 | 10/ | 0/ | 0.00/ | 100.00 |
| 11/ | 0/ | 0.00/ | 100.00 | 12/ | 0/ | 0.00/ | 100.00 | 13/ | 0/ | 0.00/ | 100.00 | 14/ | 0/ | 0.00/ | 100.00 | 15/ | 0/ | 0.00/ | 100.00 |
| 16/ | 0/ | 0.00/ | 100.00 | 17/ | 0/ | 0.00/ | 100.00 | 18/ | 0/ | 0.00/ | 100.00 | 19/ | 0/ | 0.00/ | 100.00 | 20/ | 0/ | 0.00/ | 100.00 |
| 21/ | 0/ | 0.00/ | 100.00 | 22/ | 0/ | 0.00/ | 100.00 | 23/ | 0/ | 0.00/ | 100.00 | 24/ | 0/ | 0.00/ | 100.00 | 25/ | 0/ | 0.00/ | 100.00 |
| 26/ | 0/ | 0.00/ | 100.00 | 27/ | 0/ | 0.00/ | 100.00 | 28/ | 0/ | 0.00/ | 100.00 | 29/ | 0/ | 0.00/ | 100.00 | 30/ | 0/ | 0.00/ | 100.00 |
| 31/ | 0/ | 0.00/ | 100.00 | 32/ | 0/ | 0.00/ | 100.00 | 33/ | 0/ | 0.00/ | 100.00 | 34/ | 0/ | 0.00/ | 100.00 | 35/ | 0/ | 0.00/ | 100.00 |
| 36/ | 0/ | 0.00/ | 100.00 | 37/ | 0/ | 0.00/ | 100.00 | 38/ | 0/ | 0.00/ | 100.00 | 39/ | 0/ | 0.00/ | 100.00 | 40/ | 0/ | 0.00/ | 100.00 |

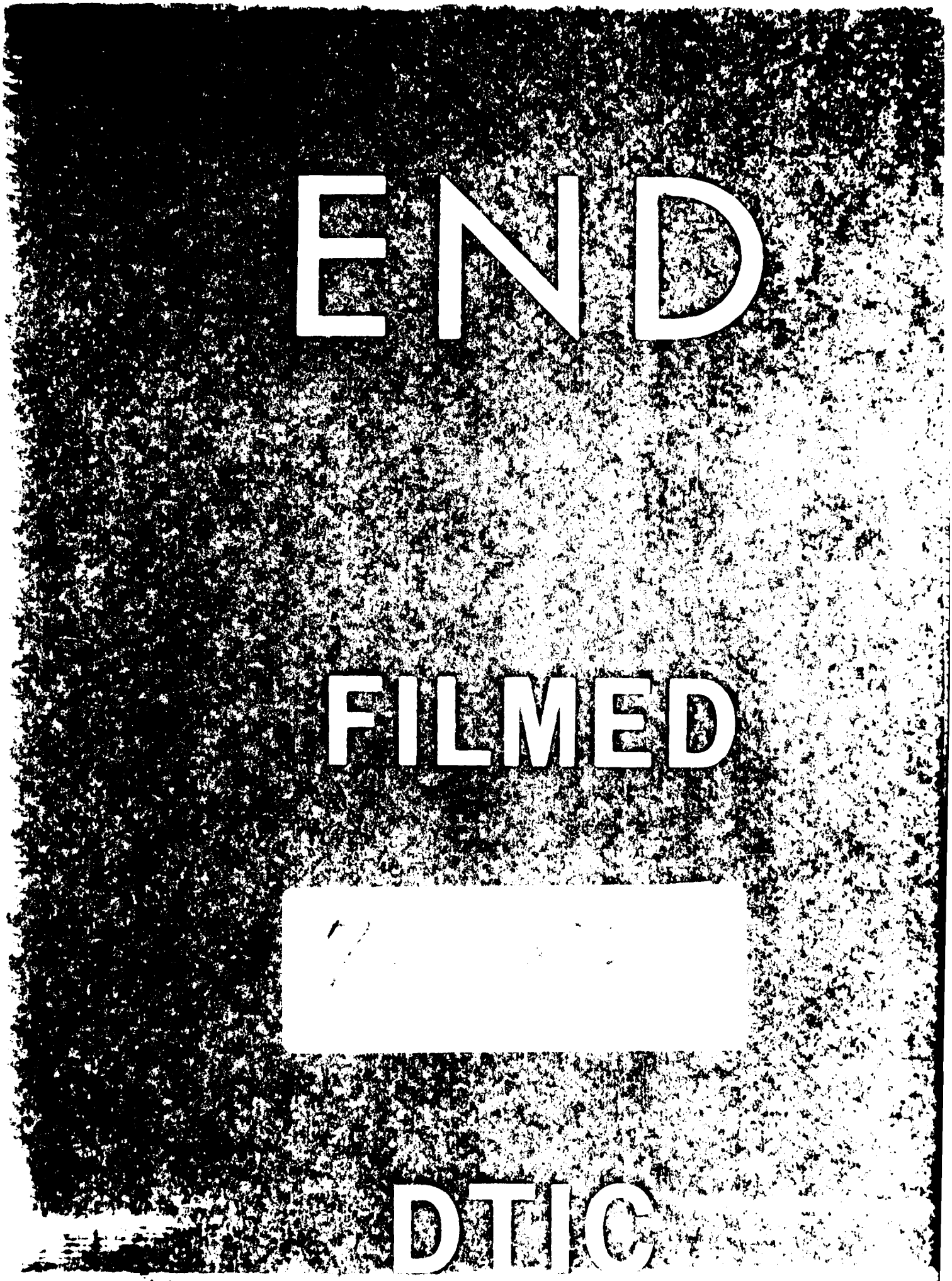
AMMO RESUPPLY TOTAL= 54.0

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1/ | 0/ | 0.00/ | 0.00 | 2/ | 0/ | 0.00/ | 0.00 | 3/ | 0/ | 0.00/ | 0.00 | 4/ | 7/ | 12.96/ | 12.96 | 5/ | 15/ | 27.78/ | 40.74 |
| 6/ | 22/ | 40.74/ | 81.48 | 7/ | 10/ | 18.52/ | 100.00 | 8/ | 0/ | 0.00/ | 100.00 | 9/ | 0/ | 0.00/ | 100.00 | 10/ | 0/ | 0.00/ | 100.00 |
| 11/ | 0/ | 0.00/ | 100.00 | 12/ | 0/ | 0.00/ | 100.00 | 13/ | 0/ | 0.00/ | 100.00 | 14/ | 0/ | 0.00/ | 100.00 | 15/ | 0/ | 0.00/ | 100.00 |
| 16/ | 0/ | 0.00/ | 100.00 | 17/ | 0/ | 0.00/ | 100.00 | 18/ | 0/ | 0.00/ | 100.00 | 19/ | 0/ | 0.00/ | 100.00 | 20/ | 0/ | 0.00/ | 100.00 |
| 21/ | 0/ | 0.00/ | 100.00 | 22/ | 0/ | 0.00/ | 100.00 | 23/ | 0/ | 0.00/ | 100.00 | 24/ | 0/ | 0.00/ | 100.00 | 25/ | 0/ | 0.00/ | 100.00 |
| 26/ | 0/ | 0.00/ | 100.00 | 27/ | 0/ | 0.00/ | 100.00 | 28/ | 0/ | 0.00/ | 100.00 | 29/ | 0/ | 0.00/ | 100.00 | 30/ | 0/ | 0.00/ | 100.00 |
| 31/ | 0/ | 0.00/ | 100.00 | 32/ | 0/ | 0.00/ | 100.00 | 33/ | 0/ | 0.00/ | 100.00 | 34/ | 0/ | 0.00/ | 100.00 | 35/ | 0/ | 0.00/ | 100.00 |
| 36/ | 0/ | 0.00/ | 100.00 | 37/ | 0/ | 0.00/ | 100.00 | 38/ | 0/ | 0.00/ | 100.00 | 39/ | 0/ | 0.00/ | 100.00 | 40/ | 0/ | 0.00/ | 100.00 |

Figure 3—Mission Completion Tables

A second type of skill required on the study team would be computer oriented and would include computer programming, debugging, and computer operations. Individuals possessing these skills would typically be classified as programmer/analysts, computer operators, etc.

The TVFS model operates under SCOPE 3.4.3 or any later version operating system, and requires 207K octal words of core memory to operate. Execution time, while variable with the number of days to be simulated and other input data related factors, can be considered to be less than one minute for most average runs. Output reports generated by the model can be minimal if additional print options and supplemental reports are not desired. Again, the number of days of simulation will greatly affect not only the run time but also the amount of output produced.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