The CCTC Quick-Reacting General War Gaming System (QUICK) is a part of the Command & Control Technical Center (CCTC) at the Quick-Reacting System (QRS) level. This system is under the Defense Communications Agency (DCA) and the U.S. Army Electronics Command (ELECOM).
TO: 

SUBJECT: Change 1 to Technical Memorandum TM 153-77, The CCTC QUICK-Reacting General War Gaming System

1. The enclosed package contains change pages and original pages for the document. The document was reprinted because of poor quality of print of the original issue. The old document should be destroyed according to applicable security regulations.

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FOR THE DIRECTOR:

J. DOUGLAS POTTER
Assistant to the Director for Administration
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GENERAL WAR GAMING SYSTEM

General Description

SUBMITTED BY:

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Copies of this document may be obtained from the Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314

Approved for public release; distribution unlimited.
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FIGURE

1. Major Subsystems of the QUICK System.
2. Procedure and Information Flow in QUICK/HIS 6000.
3. Detailed Bomber Plan from Plan Generator.
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1. Typical Dictionary Values.
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4. Typical Data Base Item.
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ABSTRACT

This document is a nontechnical description of the computerized Quick-Reacting General War Gaming System (QUICK). It includes a broad description of system operation, input data requirements, available outputs, and typical applications.

QUICK is a tool for examining various facets of possible general wars under a variety of conditions of force posture, strategies, and starting conditions. Based upon suitable input data, QUICK will automatically generate global strategic nuclear war plans, provide statistical output summaries, and supply inputs to external simulators.

The QUICK system uses an integrated data base and has been programmed in FORTRAN for use on the CCTC HIS 6000 computer system. QUICK is structured to provide non-programmer users a direct interactive capability for a wide range of war gaming applications.

The following is a list of associated documents on the QUICK system.

a. USERS MANUAL
   Computer System Manual UM 9-77, Volume I
   Computer System Manual UM 9-77, Volume II
   Computer System Manual UM 9-77, Volume III
   Computer System Manual UM 9-77, Volume IV
   Provides detailed instructions for applications of the system.

b. PROGRAM MAINTENANCE MANUAL
   Computer System Manual CSM MM 9-77, Volume I
   Computer System Manual CSM MM 9-77, Volume II
   Computer System Manual CSM MM 9-77, Volume III
   Computer System Manual CSM MM 9-77, Volume IV
   Provides detailed instructions for maintenance of the system.
SECTION 1. SYSTEM DESCRIPTION

1.1 Purpose

This General Description is a nontechnical description of the computerized Quick-Reacting General War Gaming System (QUICK). It includes a broad description of system operation, input data requirements, available outputs, and typical applications.

The remainder of this section provides an overview of the QUICK system, its major parts, and the hardware/software environment in which it is operational.

1.2 Program Environment - QUICK System Overview

The QUICK-Reacting General War Gaming System (QUICK) is a unique analytical tool which provides a comprehensiveness to strategic war gaming that has not been available through other computerized models. QUICK is designed to assist in the study of strategic conflicts involving a large-scale exchange of nuclear weapons. Toward this end, the system encompasses three major capabilities which are applicable to a wide range of studies: first, for a given offensive missile and bomber force and a specific set of targets, QUICK produces a detailed plan of attack which is near optimum for the conditions specified by the user. Second, it provides an expected-value estimate of the results of that attack. Finally, it supplies detailed inputs to external simulators.

QUICK is structured into four major subsystems: Data Management, Weapon/Target Identification, Weapon Allocation, and Sortie Generation. The principal tasks associated with each of these functional subsystems are summarized below.

a. Data Management: Assembles and reformats the target and non-target data required for a particular plan.

b. Weapon/Target Identification: Selects and processes the Red and/or Blue Forces pre-specified for a particular plan.

c. Weapon Allocation: Allocates offensive weapons to selected targets.

d. Sortie Generation: Prepares and evaluates missile and bomber attack plans.

Figure 1 displays the programs which comprise each subsystem.

Figure 2 illustrates the communication with the Central Operations Processor (COP) or executive software and the entire procedural and informational flow within the QUICK system. The communication lines infer action with the COP, Integrated Data Base and related modules which may
### Subsystems

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### Functional Parts

- **Executive Software**
- **Data Base Preparation**
- **Plan Generation**

---

**Figure 1.** Major Subsystems of the QUICK System
Figure 2. Procedure and Information Flow in QUICK/HIS 6000
to be executed in any reasonable order. The required processing sequence
is shown by solid lines, and the information flow by broken lines.

Processing is initiated by inputting the parameters which identify the
potential targets which are to be extracted from the CCTC Joint Resource
Assessment Data Base (JAD) files. The COP stores selected data and dy-
namically conducts the proper linkage for referral by other modules within
the QUICK system. Alternatively, required target data is obtained from
existing updatable QUICK Data Bases and also stored and linked by the
COP. Following this, specified forces are defined within the developed
QUICK Data Base and processed by the Weapon/Target Identification sub-
system, resulting in a Game Data Base which reflects the selected forces
and targets.

The next step is to prepare an attack plan for the opposing forces. This
consists of a force allocation by the Weapon Allocation subsystem, and a
detailed set of attack plans prepared by the Sortie Generation subsystem.

The major inputs required to initiate this phase of processing are:

a. A game data base prepared by the Data Management and Weapon/
Target Identification subsystems.

b. A set of parameters which relate to the strategy associated with
the plan which is to be developed.

These parameters are supplied by the planner. They reflect his views as
to the strategic attack objective, in terms of the relative values of the
various targets being considered, the forces to be withheld, the target-
ing constraints to be observed, and the initiating force; i.e., which
side attacks first.

The target values which are computed on the basis of these parameters
reflect in a very significant way the major strategic objectives of the
resultant war plan. These values are relative values and are partially
contained in the data base itself. QUICK has 15 specific classes of tar-
gets. The relative values of the targets contained in any one class are
included in the data base: the strategic objectives of the planner who
wants to use the plan generation function are expressed in how the value
scales of these various classes of targets are related to one another.
The user thereby puts more or less relative importance on each of the
classes of targets in accomplishing the strategic objectives that he
chooses. This, of course, will be related to the kind of strategy he is
contemplating for the particular war game, whether a first or second
strike, and so forth.
Having established a value for each target, the plan generation phase mathematically allocates the weapons (e.g., Red weapons to Blue targets) and prepares the detailed missile and bomber attack plans. If desired, the plans may be printed, inspected, and altered by changing the attack objectives and repeating the process. The series of Red missile and bomber events corresponding to the sortie plan is prepared in a form suitable for input to external simulators. As a user option, a war plan summary is provided which includes an expected-value estimate of the results of the attack. In addition, the aim point, Desired Ground Zero (DGZ), for each planned weapon can be output for subsequent evaluation utilizing an external damage assessment system.

While the system can proceed automatically through all steps if desired, it may be halted at the end of each module (or program), and the available output inspected for correctness and adequacy. There are standard outputs from each module and, also, mechanisms exist for producing generalized outputs (either tape/disk or printed reports). Through the COP, users may request output in any format of data items that reside within the Integrated Data Base. The user has complete flexibility in displaying needed reports.

This generalized output capability significantly enhances user flexibility in war gaming applications of the QUICK system as well as provides an added dimension to the military analysts who utilize the QUICK system.

1.3 Computer Software Environment and Programming Languages

The QUICK system runs under control of the HIS 6000 GCOS (General Comprehensive Operating Supervisor). The data base is created and maintained using a HIS data management subsystem called Integrated Data Store (IDS). Except for a few utility type subroutines which are written in the Generalized Machine Assembly Processor (GMAP) language of the HIS 6000 computer system, all QUICK programs are programmed in the FORmula TRANslator (FORTRAN) computer language.

1.4 Equipment Environment

The QUICK system is operational on the CCTC HIS 6000 computer system. Available to the QUICK system in addition to standard peripheral equipment are three 6000 processing modules, four 6000 system controllers, six 64K memory modules, and two 7-channel and 14 9-channel magnetic tape handlers. Type 181 and 190 disk storage units are available for permanent files.

Types of available remote access devices relevant to the interactive capability are:

a. VIP 786W - CRT Subsystem (EIA or 188C)

b. KSR 33B - Teletype 188C (TTY)
c. VIP 7705 - CRT Subsystem (EIA or 188C)
d. RLP 300 - Remote Printer (EIA or 188C)
e. IBM 2741 - Communications Terminal

1.5 The QUICK System Data Base

1.5.1. Nature of the Data Base. The QUICK data base is controlled by the IDS subsystem of the HIS. This type of data base permits all defined records to be dynamically linked together in some specified logical fashion. This linkage of entries allows for a generalization of data management functions; that is, record creating, updating, editing, and displaying no longer have to be conducted in a rigid structure. Through knowledge of the defined data base structure, developed modules within QUICK's data management subsystem may query the IDS data base in any manner as dictated through user commands.

1.5.2. Contents of Data Base. To provide a flexible data base, force structures corresponding to procurement schedules and to selected intelligence projections can be maintained for both Red and Blue forces or other forces. The data base contains the information required to define:

a. The capabilities and characteristics of the offensive and defensive weapon systems

b. The physical characteristics of the installations to be considered as potential targets

c. Related geographic-type data required by the system for plan generation describing penetration and depenetration corridors

d. Planning parameters such as the estimated probability of destruction before launch (DBL) established for each offensive weapon system.

1.6 Characteristics of the Plan Generation Process

The plan generation process, hereafter referred to as the Plan Generator, creates a plan for each missile and bomber weapon in the game.* Two major phases of processing are associated with plan development. The initial phase provides an allocation of weapons to targets that maximizes the expected damage to the opposing target set within constraints imposed by the user. For efficiency in this phase, the offensive weapons are aggregated into groups which share delivery vehicle characteristics and are located in the same geographic area. Thereafter a representative weapon from each group is considered as the weapon to be allocated. In the second phase of processing, the initial allocation is refined so that specific weapons are assigned to specific targets. Then the sortie specifications for each delivery vehicle are prepared.

*Operationally, the plan generation process (or Plan Generator), consists of the Weapon Allocation, and the Sortie Generation subsystems of QUICK.
Each sortie from each bomber base or missile launch site is constructed as a detailed series of events which constitute the plan for each delivery vehicle.

1.6.1 Constraints and Uncertainties. During the weapon allocation phase, the Plan Generator explicitly considers several operational constraints and uncertainties. Among these are:

a. Physical constraints on weapon systems: operational constraints such as range, speed, and operational alert status are considered in developing the allocation. Optional capabilities are provided which permit the user to direct the assignment of a specific type of weapon to a target. Furthermore, weapon groups can be restricted from allocation against specified geographical regions of the target area, specific target types, or even a specific target.

b. Time dependence of target value: target values are established on the basis of input parameters provided by the user. These values can be defined as being time dependent, so that the assigned value of the target will degrade over time and can change at five different time intervals.

c. Planning factor uncertainties: the weapon allocation phase of plan generation explicitly considers uncertainty in various factors affecting weapon target interactions. Variances and uncertainties of target hardness, time dependence of target value, level of terminal ballistic missile defense, and inter-weapon correlation are considered in making weapon allocations. The plan is then constructed to be relatively insensitive to variance from the planned value established for such parameters.

d. Correlation in weapon delivery probabilities for similar weapon systems: in addition to considering the weapon system constraints of range, speed, and reliability, the allocator explicitly considers the interweapon correlations in delivery probabilities (i.e., risk factors in weapon failure modes which are shared by weapon systems of similar characteristics). The intent here is to provide QUICK with some basis for estimating the degree of risk which is shared by weapons, so that the Plan Generator can plan around these shared risks. The use of this technique ensures that the final plan will reflect a reasonable level of cross targeting. Thus, unexpectedly high failure rates for any specific weapon type, or group of weapons, will not result in a catastrophic failure of the war plan.

e. Prescribed levels of destruction: the user may prescribe for any target, or set of targets, the minimum or maximum damage expectancy which is to be achieved during the weapon allocation phase.
1.6.2 Detailed Sortie Generation. During the second phase of processing, the Plan Generator converts the allocation of weapons to targets, developed in the initial phase, into a plan of sufficient detail that it can be used as input to external simulators or damage assessment models. The development of bomber plans requires the geographic grouping of targets for assignment to a single bomber. In accomplishing this, the Plan Generator assigns the targets to the aircraft on specific bases, taking into account the number and types of bombs carried by each aircraft configuration as well as the need to coordinate the timing of bomber sorties with defense suppression targeting. In addition, a flight profile is developed which specifies where the low-altitude capability, if available, should be used. Within range constraints, the bomber is flown at low altitude as much as possible during the most vulnerable portion of the flight.

Depenetration and recovery routing are also planned for each bomber capable of such actions.

The development of missile plans (sorties) is somewhat less complex. In QUICK, those missiles equipped with a single warhead and those possessing a multiple re-entry vehicle (MRV) capability are allocated to a single target. For these missile delivery systems, the Plan Generator prepares launch times dependent upon user-specified conditions. For a plan in response to an enemy first strike, launch occurs on the receipt of early warning, plus any delay times specified in the data base. For a first strike plan, missiles may be launched so as to be coordinated at launch, or at the target, or at intermediate times.

For those missiles with a multiple independently targetable re-entry vehicle (MIRV) capability, including submarine-launched ballistic missiles, the sortie generation phase is somewhat different. The design concept used to treat MIRV-capable systems allows the weapon-to-target allocation to be developed without regard to "footprint" constraints; that is, constraints on the geographic configuration of targets assigned to a single missile equipped with MIRVs. After the weapons have been allocated, a separate processor collects all the MIRV weapons and their potential targets for further processing. The set of targets assigned to each group of MIRV weapons is then divided into subsets, each of which is a feasible assignment of targets for the weapons on a single missile. These assignments are subsequently tested by an analytical approximation to the physical constraints of the MIRV system to ensure the feasibility of the assignment.

1.6.3 Naval Forces. The play of strategic naval forces (excluding submarine-launched ballistic missiles) is modeled in an aggregated manner. The allocation of weapons to naval forces within QUICK, therefore, is a game within a total game, using parameters specified by the user. In particular, the probability that a weapon will destroy a naval target (assuming defense penetration) is a user input for naval play.
1.6.4 Target Defenses. The Plan Generator considers anti-missile and bomber defenses during both phases of plan development. For bombers, area attrition by air defense interceptors is modeled by a probability of bomber survival in enemy territory as a function of distance flown. This probability is modified by factors that consider estimated penetrator density and altitude of flight. Local bomber defenses provided by surface-to-air missiles (SAMs) are modeled by a single parameter which indicates the level of bomber defense available at each target. This parameter generates for each bomber the probability of survival at each target to which it is assigned.

Missile defenses are also divided into two categories, area and terminal. The plan generation process considers only a random area ballistic missile defense system, one in which each incoming object has the same probability of being assigned an interceptor.

1.6.5 Plan Evaluation. The weapon allocator of the Plan Generator is a valuable evaluation tool. Because it determines the most desirable assignment of weapons to targets for a given force, it can be used to compare different force structures (each optimally allocated to the enemy target system). In addition, for each type of weapon used in the allocation, the Plan Generator produces an estimate of the potential contribution toward the objectives of the plan that might be made if additional weapons of that type were available. The allocator can thus be used as a major exploratory tool.

The Plan Generator also includes an optional processor which may be used to summarize the allocation and to provide an expected-value estimate of its results. Provision is also included to evaluate the allocation for variations in the values of planning parameters which describe the weapons and targets considered during the allocation phase.

1.7 System Interfaces

The plan generation process provides a detailed missile and bomber strike plan suitable for input to the preprocessors of the following general war gaming simulators:

a. The Event Sequenced Program (ESP) maintained by the Joint Strategic Target Planning Staff

b. The Nuclear Exchange Model (NEMO) maintained by the Chief of Naval Operations (OP-963G).

Additionally, both the plan generation and output data process of QUICK provide outputs suitable for input into standard damage assessment systems. The Single Integrated Damage Analysis Capability System (SIDAC) is used by CCTC.
SECTION 2. USER/SYSTEM INTERACTION

The Central Operations Processor (COP), or QUICKs executive module, acts as an intermediary between the user and the operating system, and provides the communication between the QUICK system and the integrated data base (see figure 2). The COP acts accordingly by interpreting user commands written in imperative text English formats. These commands permit data construction, access, maintenance, validations and display, as well as provide QUICK module execution.

QUICK’s text English command language contains lists of permissible entries (or words) that have meaning to the COP. In addition, the entries have a structure, or syntax, whereby separate entries (words) are strung together in a defined, logical fashion to provide mutual user understanding. QUICKs text English command language, then, is similar to formal English, which contains definable words and a grammar or set of rules describing how these words may be presented. As with formal English, words for QUICKs command language (and syntax) are in groups from which the grammar is defined. Specifically, words are defined (grammatically) as belonging to the groups of Verbs, Adverbs, Special Words, Operators, Nulls and Attributes.

2.1 Text English Dictionary

All permissible words within the developed language that have meaning to the COP are contained within the 'Dictionary' (a list of tables stored within the data base). These words contain attributes (as employed for target and weapon definition), plus other words necessary for the syntax development. Words within the dictionary are grouped as:

- Attributes - List of variables necessary for data base construction (see section 3).
- Verbs - A list of words describing the Action of each sentence.
- Adverbs - A list of words used to modify the verb or introduce 'Clauses'.
- Special Words - A list of words that cannot be classified as attributes, verbs, or adverbs.
- Operators - A list of words or symbols necessary for defining mathematical expressions.
- Nulls - A list of words that makes a sentence readable but that are not necessary for understanding a command.
- Syntax Directory - A list that defines how words within a sentence may be connected.
2.2 Imperative Sentences

Each command generated by the user for input to the QUICK system is written as an imperative sentence. Since the system interprets all sentences, COP is the assumed subject. Some characteristics of sentences are listed below.

- A verb initiates all sentences;
- A sentence may contain only one verb;
- Sentences are interpreted left to right;
- Sentences may be of any length;
- Blank(s) separate words;
- More than one sentence may be placed on a record (either a data card or a VIP transmittal line);
- Sentences may begin in any column of the record (card or VIP).

From the verb, the system has the ability to ascertain and execute the correct computer module and provide as input any text that follows the verb up to the occurrence of the next verb, which initiates a new set of instructions. The appearance of a following verb does not imply the initiation of a new module. For some cases, data records may be changed, new ones created and/or old ones deleted; all of these commands are met within one module, but separate verbs are required to define objectives.

2.3 Dictionary Entries and Sentence Usage

2.3.1 Dictionary Entries. The major groupings of dictionary values were outlined in subsection 2.1. Typical values for attributes are specified in section 3. Some typical entries for each sentence part are outlined in table 1.

2.3.2 Sentence Usage. The nature of the text English commands is completely generalized to the degree possible within the confines of the developed structure. Examples best illustrate their powerful usage. Consider the command:

CHANGE WHERE DESIG=AB123 SETTING CNTRYLOC = UR

This command will set attribute CNTRYLOC to UR for target designator AB123.

A command that will change more than one record could be:
Table 1. Typical Dictionary Values

<table>
<thead>
<tr>
<th>SENTENCE PARTS</th>
<th>VALUES</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verb</td>
<td>CREATE</td>
<td>Build a new data record</td>
</tr>
<tr>
<td></td>
<td>CHANGE</td>
<td>Alter the contents of a developed data record</td>
</tr>
<tr>
<td></td>
<td>DELETE</td>
<td>Delete a data record</td>
</tr>
<tr>
<td></td>
<td>PRINT</td>
<td>Print a data record</td>
</tr>
<tr>
<td></td>
<td>INDEX</td>
<td>Execute module INDEXER</td>
</tr>
<tr>
<td>Adverb</td>
<td>SETTING</td>
<td>Introduce a clause that defines data elements to be stored</td>
</tr>
<tr>
<td></td>
<td>WHERE</td>
<td>Introduce a generalized clause that defines a subset of the data base</td>
</tr>
<tr>
<td>Special Words</td>
<td>ASCENDING</td>
<td>Describe a sorting order</td>
</tr>
<tr>
<td></td>
<td>LINE</td>
<td>Introduce a print line</td>
</tr>
<tr>
<td>Operators</td>
<td>+ (or PLUS)</td>
<td>Add</td>
</tr>
<tr>
<td></td>
<td>* (or TIMES)</td>
<td>Multiply</td>
</tr>
<tr>
<td>Nulls</td>
<td>FROM</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>THE</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>ON</td>
<td>-</td>
</tr>
</tbody>
</table>
CHANGE WHERE CLASS = U/I SETTING VAL=POP*10

This command will alter all records under target class U/I. The attribute VAL will be set to attribute POP multiplied by 10. Note that mathematical expressions may be written within a command.

A create command would be:

CREATE SETTING CLASS=MISSILE LAT=100000N LONG=1260600W DESIG=AA009

A new missile record will be created with the values stored as specified within the command.
SECTION 3. ATTRIBUTE INPUT AND STANDARD OUTPUT

3.1 System Inputs

The primary input to the QUICK system is the data base. The data requirements of the QUICK system, and hence the effort and time required to prepare the data base will vary according to the objectives, nature, and scope of the specific planning task involved. Notwithstanding this fact, the total volume of input required to support a wide range of studies is substantial and can involve extensive research and coordination. Consequently, as indicated in the first chapter, CCTC maintains and periodically updates a QUICK data base. This data file may be viewed as a master data base, in that it contains more information than is required to produce a single set of Red and Blue plans. The data preparation process is the construction of text English commands to extract selected data from the file (and other external sources) and prepare a game data base which is appropriate for the plan which is to be developed. (Table 2 provides an example of the type of data maintained in the QUICK data base.)

The three principal data sources used in assembling the data maintained in the CCTC QUICK data base are the CCTC Resource File, the air order of battle files (AOB files) prepared by the Defense Intelligence Agency (DIA), and various manually prepared inputs provided by the SAGA. While the majority of the required data are retrieved from the existing automated source files maintained by CCTC, certain data are related directly to the plan being developed and are therefore not available from these files. These data, e.g., the specific weapons assigned to each type delivery vehicle and the staging of bombers at various airfields, are usually prepared by the user and added to the data base via text English commands.

The information included in the data base is categorized by CLASS, e.g., bombers, and by TYPE within class, e.g., B-52. Fifteen classes may be used to describe the targetable-type installations included in the data base. Data categories typical within each target class are shown in Table 3. There is no restriction in the naming of target classes. In addition to these target classes, auxiliary data classes (Table 3) are used to enter weapon-type data such as the specific composition of a bomber payload (bombs, air-to-surface missiles (ASMs), electronic countermeasures (ECMs), and decoys) and geographic-type data required by the system. Geographic-type data are required to be defined for bomber routing. For example, within the Plan Generator, penetration and depenetration routing of aircraft is controlled through the use of corridors established by the planner. The data defining each of the route points associated with these corridors are included in the auxiliary class segment of the data base.

Each item entered in the data base, e.g., a bomber squadron, is defined using a variable number of attribute-value pairs. The attribute-value
Table 2. Typical Data Base Elements Included in QUICK

OFFENSIVE WEAPONS
Types
- Strategic Bombers
- Strategic Missiles
- Tactical Nuclear Bombers
- Tactical Nuclear Missiles
Numbers
Characteristics
- Numbers and Yield of Warheads
- Accuracy
- Reliability
- Range
- Speed
- Electronic Countermeasures (ECMs)

DEFENSIVE WEAPONS
Types
- Manned Interceptors
- Surface-to-Air Missiles
- Anti-Ballistic Missile (ABM) Systems

TARGETS
Types
- Offensive Weapon Launch Bases
- Defensive Weapon Bases
- Command and Control Sites
- Early Warning Stations
- Military Support Installations
- Urban/Industrial Complexes
Characteristics
- Geographic Location
- Vulnerability
- Value
Table 3. QUICK Classes

TARGET CLASS

Offensive missiles
Offensive bombers
Tankers
Defensive command and control
Interceptor aircraft
Offensive command and control
Nuclear storage sites
Airfields
Naval targets
Troops
Communications
Miscellaneous (e.g., engineer facilities)
Urban/industrial targets
Area ABM defense components
Reserved for future use

AUXILIARY CLASS           PURPOSE

PAYLOD                      Identifies weapons and penetration aids carried by a missile or bomber

BOMB
ASM
RV
MRV
MRV
FACTOR

MSLWEP                      Defines missile, bomber, and tanker weapon systems
EBMWEP
TNKWEP

FENCOR                      Identifies penetration and depenetration corridors
DEPCOR

WEPGRP                      Provides weapon group data
RECOV                       Identifies recovery base data
REFUEL                      Provides for refuel points
REGION                      Provides for region points
COMPLX                      Contains target complex data
pair consists of the attribute name, such as CLASS, and the value of
that attribute, such as BOMBER. The order of input of the attribute-
value pairs is immaterial, and no upper limit exists on the number of
pairs which may be used to describe an item. As an example, table 4
reflects seven attribute-value pairs used to describe a missile squad-
ron.

While there are no restrictions on the quantity of data that may be
maintained in the data base, there are constraints (upper limits) on
the amount of data the QUICK system can handle. A few of these upper
limits are shown in table 5.

Besides the information in the data base, additional information is re-
quired at various stages in the execution of QUICK for the selection of
system options, e.g., type of printed output desired or designation of
a specific weapon to be allocated against a particular target.

3.2 Primary Outputs

The primary outputs of the war game are estimates of losses to the pri-
mary military forces resulting from the nuclear exchange. Using a CCTC
damage analysis system (such as SIDAC) and the ground zeros simulated
in the QUICK game, it is possible to perform vulnerability analysis
calculations on any category of military or industrial value for which
there are geographic distribution data available. In addition to dam-
age summaries, it is possible to determine time distributions of various
quantities, such as megatons delivered or targets destroyed. Some of
the above information is routinely presented as part of the standard
summary output. Other results can be printed on request. If a game is
repeated using different sets of random numbers, statistics representing
the distribution of results may be computed manually.

Additionally, and as described in section 2 previously, nonprogrammer
users may use the text English PRINT verb to generate output to inves-
tigate the results of any module or program. The types of these reports
are very generalized.

The output of the Plan Generator is not only the war plan, in terms of
allocations of individual weapons to individual targets, but also ex-
pected values of the survivability of each target class (based on plan-
ning factors). An auxiliary output from the allocation phase is a set
of estimates of the contribution that additional weapons of each type
would make toward achieving the objectives of the plan. Thus, for prob-
lems in which an estimate of expected target destruction is adequate,
the Plan Generator is sufficient in itself.

As indicated below, some typical examples of QUICK output are shown in
figures 3 and 4.

a. Figure 3 describes the detailed bomber plan which is output by
the Plan Generator for each bomber sortie.
b. Figure 4 depicts the detailed missile plan output by the Plan Generator.
Table 4. Typical Data Base Item

<table>
<thead>
<tr>
<th>ATTRIBUTE</th>
<th>ATTRIBUTE DESCRIPTION</th>
<th>TYPICAL VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLASS</td>
<td>Class name</td>
<td>MISSILE</td>
</tr>
<tr>
<td>TYPE</td>
<td>Type designation</td>
<td>MM-1</td>
</tr>
<tr>
<td>SIDE</td>
<td>Side (Red or Blue)</td>
<td>BLUE</td>
</tr>
<tr>
<td>LAT</td>
<td>Latitude (degrees, minutes, and seconds, north or south)</td>
<td>482030N</td>
</tr>
<tr>
<td>NOPERSQ</td>
<td>Number of missiles per squadron</td>
<td>50</td>
</tr>
<tr>
<td>NALERT</td>
<td>Number of missiles in an alert (ready) status</td>
<td>40</td>
</tr>
<tr>
<td>PLABT</td>
<td>Probability of a launch abort</td>
<td>0.05</td>
</tr>
</tbody>
</table>

Table 5. QUICK Data Constraints

<table>
<thead>
<tr>
<th>CONSTRAINT</th>
<th>UPPER LIMIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Targets (total)</td>
<td>Open-ended</td>
</tr>
<tr>
<td>Missiles plus Bomber (types/side)</td>
<td>100</td>
</tr>
<tr>
<td>Warhead types (total)</td>
<td>50</td>
</tr>
<tr>
<td>Payload types (per side)</td>
<td>40</td>
</tr>
<tr>
<td>Bomber penetration corridors (per side)</td>
<td>30</td>
</tr>
<tr>
<td>Weapon groups (per side)</td>
<td>250</td>
</tr>
<tr>
<td>Weapons (per group)</td>
<td>1,000</td>
</tr>
</tbody>
</table>
**Figure 3. Detailed Bomber Plan from Plan Generator (Part 1 of 4)**

<table>
<thead>
<tr>
<th>CHARGE</th>
<th>TIME (HUT)</th>
<th>PLACE (XPL)</th>
<th>EVENT (JTP)</th>
<th>LATTITUDE (D)</th>
<th>LONGITUDE (D)</th>
<th>CUMULATIVE</th>
<th>WARHEAD</th>
<th>DGX</th>
<th>DOT</th>
<th>DESIG</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7.740</td>
<td>2100</td>
<td>LAUNCH B</td>
<td>0441200N</td>
<td>1030539W</td>
<td>-7.74</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
<tr>
<td>2</td>
<td>0.000</td>
<td>0</td>
<td>REFUEL</td>
<td>0690850N</td>
<td>1061522W</td>
<td>-4.65</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
<tr>
<td>3</td>
<td>0.000</td>
<td>0</td>
<td>INJECTOR</td>
<td>0730000N</td>
<td>0850000E</td>
<td>0.01</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
<tr>
<td>4</td>
<td>0.000</td>
<td>0</td>
<td>COLON</td>
<td>0730000N</td>
<td>0850000E</td>
<td>0.01</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
<tr>
<td>5</td>
<td>0.000</td>
<td>0</td>
<td>GO HIG</td>
<td>0603643W</td>
<td>0612913E</td>
<td>3.40</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
<tr>
<td>6</td>
<td>0.000</td>
<td>0</td>
<td>DROPBOMB 1</td>
<td>0593650N</td>
<td>0602904E</td>
<td>3.56</td>
<td>1</td>
<td>8</td>
<td>23</td>
<td>AD741UR</td>
</tr>
<tr>
<td>7</td>
<td>0.000</td>
<td>0</td>
<td>DROPBOMB 2</td>
<td>0593650N</td>
<td>0602904E</td>
<td>3.58</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>AD444UR</td>
</tr>
<tr>
<td>8</td>
<td>0.000</td>
<td>0</td>
<td>DROPBOMB 3</td>
<td>0593650N</td>
<td>0602904E</td>
<td>3.69</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
<tr>
<td>9</td>
<td>0.000</td>
<td>0</td>
<td>DROPBOMB 4</td>
<td>0593650N</td>
<td>0602904E</td>
<td>3.75</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
<tr>
<td>10</td>
<td>0.000</td>
<td>0</td>
<td>DROPBOMB 5</td>
<td>0593650N</td>
<td>0602904E</td>
<td>4.00</td>
<td>0</td>
<td>6</td>
<td>-6</td>
<td>11</td>
</tr>
<tr>
<td>11</td>
<td>0.000</td>
<td>0</td>
<td>DROPBOMB 6</td>
<td>0593650N</td>
<td>0602904E</td>
<td>4.22</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
<tr>
<td>12</td>
<td>0.000</td>
<td>0</td>
<td>DROPBOMB 7</td>
<td>0593650N</td>
<td>0602904E</td>
<td>4.46</td>
<td>0</td>
<td>77</td>
<td>17</td>
<td>52</td>
</tr>
<tr>
<td>13</td>
<td>0.000</td>
<td>0</td>
<td>DROPBOMB 8</td>
<td>0593650N</td>
<td>0602904E</td>
<td>5.17</td>
<td>0</td>
<td>77</td>
<td>52</td>
<td>00000</td>
</tr>
<tr>
<td>14</td>
<td>0.000</td>
<td>0</td>
<td>DROPBOMB 9</td>
<td>0593650N</td>
<td>0602904E</td>
<td>5.50</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
<tr>
<td>15</td>
<td>0.000</td>
<td>0</td>
<td>DROPBOMB 10</td>
<td>0593650N</td>
<td>0602904E</td>
<td>5.90</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
<tr>
<td>16</td>
<td>0.000</td>
<td>0</td>
<td>DROPBOMB 11</td>
<td>0593650N</td>
<td>0602904E</td>
<td>6.61</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
<tr>
<td>17</td>
<td>0.000</td>
<td>0</td>
<td>DROPBOMB 12</td>
<td>0593650N</td>
<td>0602904E</td>
<td>6.61</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>00000</td>
</tr>
</tbody>
</table>

**Note:** The table details the plan for a detailed bomber operation, including the time, place, event, and cumulative warhead values. Each entry corresponds to a specific event in the mission plan. The plan is generated using a plan generator and is part of a larger document, as indicated by the label (Part 1 of 4).
<table>
<thead>
<tr>
<th>HEADING</th>
<th>LABEL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PRINT NUMBER</td>
<td>Print request number, as on print request card</td>
</tr>
<tr>
<td></td>
<td>SORTIE SEQUENCE</td>
<td>Sortie sequence number</td>
</tr>
<tr>
<td>SIDE</td>
<td>GROUP</td>
<td>Weapon group index number, as assigned in program PLANSET</td>
</tr>
<tr>
<td></td>
<td>CORRIDOR</td>
<td>Penetration corridor index number for weapon</td>
</tr>
<tr>
<td></td>
<td>SORTIE</td>
<td>Sortie index number</td>
</tr>
<tr>
<td></td>
<td>INBASE</td>
<td>Launch base index number</td>
</tr>
<tr>
<td>IINDV</td>
<td>MHT</td>
<td>Index to the individual vehicles on the base</td>
</tr>
<tr>
<td></td>
<td>SPF</td>
<td>Index to alert status: 1 = alert, 2 = nonalert</td>
</tr>
<tr>
<td>TYPE</td>
<td>IREF</td>
<td>Index to the weapon type table</td>
</tr>
<tr>
<td></td>
<td>IREF</td>
<td>Refueling index number:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10 = Automatic refuel area allocated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 = No refuel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-1 = Buddy refuel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-2 = Buddy refuel: original number/squadron halved</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-3 = Air-breathing missile</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-4 = Single automatic refuel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-5 = Two automatic refuel, both automatic</td>
</tr>
<tr>
<td></td>
<td>ASSIGNED REF</td>
<td>Index of refuel area assigned if automatic tanker allocation is utilized</td>
</tr>
<tr>
<td></td>
<td>INDEX</td>
<td>Depenetration corridor index number</td>
</tr>
<tr>
<td></td>
<td>ASSIGNED DEFEN</td>
<td>Depenetration corridor index number is reassigned here when last target is an ASM target; values are supplied for both primary and alternate sorties</td>
</tr>
<tr>
<td></td>
<td>PAYLOAD</td>
<td>Index to payload table</td>
</tr>
<tr>
<td></td>
<td>FUNCTION</td>
<td>Weapon function code</td>
</tr>
</tbody>
</table>

Figure 3. (Part 2 of 4)
<table>
<thead>
<tr>
<th>HEADING</th>
<th>LABEL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>-</td>
<td>Sequence number of events within sortie plan (History table index) and a &quot;C&quot; if the event was changed.</td>
</tr>
<tr>
<td>5</td>
<td>TIME</td>
<td>Time between events in hours; in line one, the value represents the time from start of game.</td>
</tr>
<tr>
<td>6</td>
<td>PLACE</td>
<td>Represents the index numbers of launch bases, refuel areas, defense zone boundaries, targets, and recovery points; for LAUNCH events, it is the number of decoys launched (if positive) or terminated (if negative); otherwise, XPL is zero.</td>
</tr>
<tr>
<td>7</td>
<td>EVENT (JTP)</td>
<td>Index numbers to QUICK event codes.</td>
</tr>
<tr>
<td>8</td>
<td>EVENT TYPE</td>
<td>Mnemonic identifier of event.</td>
</tr>
</tbody>
</table>

- LAUNCH M = Launch missile
- LAUNCH O = Bomber launch
- REFUEL = Refuel
- DROPSOMB = Drop bomb
- MISSATK = Missile attrition event
- ENTERREF = Enter refuel area (tankers)
- LEAVEREF = Leave refuel area (tankers)
- ABORT = Abort
- LAUNAASM = Launch ASM
- LAUNCHCOY = Launch decoy
- RECOVER = Recover
- CHANGALT = Change altitude
- GO HIGH = Go to high altitude
- GO LOW = Go to low altitude
- DOOLEG = Dogleg

Figure 3. (Part 3 of 4)
<table>
<thead>
<tr>
<th>HEADING</th>
<th>LABEL</th>
<th>DESCRIPTION</th>
</tr>
</thead>
</table>
| 10      | LATITUDE      | Latitude of event in geographic coordinates  
If dropbomb or ASHTGT, coordinates are those of target lead DESIG |
| 11      | LONGITUDE     | Longitude of event in geographic coordinates  
If dropbomb or ASHTGT, coordinates are those of target lead DESIG |
| 12      | CUMULATIVE TIME | Cumulative time at each event                                                |
| 13      | WARHEAD TYPE  | Warhead index number; nonzero only for DROPBOMB OR LAUN ASM events          |
| 14      | DCX           | Target offset in fiftieth of nautical miles (positive west)                 |
| 15      | DCY           | Target offset in fiftieth of nautical miles (positive north)                |
| 16      | DESIG         | Target Designator plus Country Location                                     |
| 17      | CHANGE DATE   | Date of recorded change initiated by C, I, A card in module ALTPLAN          |

Figure 3. (Part 4 of 4)
<table>
<thead>
<tr>
<th>MISSILE INDEX</th>
<th>SITE</th>
<th>LAT.</th>
<th>LAT.</th>
<th>INDEX</th>
<th>LAT.</th>
<th>TIME</th>
<th>USCIC</th>
<th>TTI ENTRY</th>
<th>F</th>
<th>MOS</th>
<th>CHANGE DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>456</td>
<td>46.0</td>
<td>101.0</td>
<td>1686</td>
<td>50.4</td>
<td>247.5</td>
<td>0.187</td>
<td>A8179</td>
<td>0</td>
<td>1</td>
<td>07/70</td>
</tr>
<tr>
<td>6</td>
<td>456</td>
<td>46.0</td>
<td>101.0</td>
<td>1686</td>
<td>50.4</td>
<td>247.5</td>
<td>0.187</td>
<td>A8179</td>
<td>0</td>
<td>1</td>
<td>07/70</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TABLE OF CONTENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. MISSILE INDEX</td>
</tr>
<tr>
<td>2. SITE LAT.</td>
</tr>
<tr>
<td>3. LAT.</td>
</tr>
<tr>
<td>4. INDEX</td>
</tr>
<tr>
<td>5. TIME</td>
</tr>
<tr>
<td>6. USCIC</td>
</tr>
<tr>
<td>7. TTI ENTRY</td>
</tr>
<tr>
<td>8. F</td>
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**Figure 4. Detailed Missile Plan from Plan Generator**
SECTION 4. APPLICATIONS

Two primary fields of application for the QUICK system are war plan evaluation and future force posture studies. Because the models in the system deal with various facets of the war, studies of smaller scope can also be carried out with QUICK. Among these are: the effect of changes in targeting criteria (such as target values or required damage levels); variations and uncertainties in basic parameters for friendly and opposing forces; and the effect of different levels of ballistic missile defense, deployments of defense, and allotments of penetration aids among the attack force.

The remainder of this section discusses each of these study types in turn, and also comments on problems to which QUICK should not be applied.

4.1 Potential Applications

4.1.1 War Plan Evaluation. One of the major uses of the QUICK system is to generate the hypothetical Red Integrated Strategic Offensive Plan (RISOP). The QUICK-developed RISOP can then be used to evaluate other plans for general war, such as the Single Integrated Operational Plan (SIOP). This evaluation can be carried out using an existing system developed for SIOP/RISOP gaming, such as the U.S. Navy's Nuclear Exchange Model (NEMO) or the Joint Strategic Target Planning Staff's Event Sequenced Program (ESP). Alternatively, a pseudo-SIOP could be developed by the QUICK Plan Generator.

The principal advantage of the use of QUICK for RISOP generation is that the shorter development time permits testing the SIOP under a variety of enemy plans. This sensitivity analysis makes it possible to determine if there are likely conditions under which the SIOP is unsatisfactory and/or can be improved.

4.1.2 Force Posture Studies. Another use of the QUICK system is for the study of future force postures, i.e., an analysis involving the evaluation of forces and/or force deployments postulated for a future time frame. An example of such an application is the study of force requirements wherein the primary quantity of interest is the number of weapons (such as Minuteman) in the U.S. strategic inventory, and how variations in these numbers will change the U.S. capability to wage a strategic nuclear war. Sensitivity of results can also be investigated with respect to various assumptions, such as condition of war initiation and intelligence on enemy numbers and characteristics. While war game results are only one type of input to such studies, they provide a useful set of quantitative trade-offs for supporting the determination of recommended force postures.
For future force posture studies, QUICK can be used not only in its most straightforward form but also in a special rapid-response mode, capitalizing on the Plan Generator as a short-cut war plan evaluator. The usual force posture study will proceed from selection of input from the data base through plan generation and sortie generation. The short form of analysis will use only the data input process and the Plan Generator. Damage estimates for this type of analysis will thus be based on the "planning factor" type data used by the Plan Generator, such as the probabilities of penetration and destruction before launch (DBL). The most effective utilization of QUICK in this way implies a continuing effort, through its exercise, to build up experience and accumulated results so that "new" study requests are only variations of previous cases.

Another possible type of force posture study is the evaluation of a new weapon system, such as an orbital bombardment system. Since such weapons involve new aspects of timing and coordination, the war game approach can add significantly to an evaluation of the impact that the introduction of such weapons might have on a nuclear exchange. The QUICK system is sufficiently flexible to accommodate the introduction of some new weapon systems by the appropriate choice of parameters and characteristics.

Other force posture variations are also possible, such as the investigation of the effect of changing nuclear weapons carried on strategic bombers from one or two large weapons to several smaller ones.

4.1.3 Studies of Alternate Strategies. In addition to providing a capability for rapid analysis of variations in force levels and choice of weapons, the system permits the study of alternative ways of using the forces postulated. The inherent flexibility of the Plan Generator, e.g., to withhold certain types of forces, or to avoid certain classes of targets, allows study of many options and alternatives in the use of a given force posture.

4.2 Inappropriate Applications

At the other end of the spectrum, it may be inadvisable to attempt to use QUICK for overly detailed problems in its current configuration. For example, QUICK should not be used in an attempt to determine (a) the capabilities of various communication equipment and network in a command and control system, (b) an optimal mix of warheads, decoys, chaff, and electronic countermeasures for use in ballistic missile penetration, or (c) appropriate evasive tactics for bombers engaged by the enemy. At present, the system does not contain sufficient detail to treat such questions.
QUICK is not intended as a tool for study of limited wars, and it is not recommended that it be modified for such application. Limited war games can provide some of the starting conditions for a general war game, but there should be a definite distinction between the two. The primary reason for the separation is that there is little agreement on how the movement of ground forces and other conventional actions would interact with the other portions of a general war.

As a final precaution, the user is cautioned against attempting to run the game for all possible conditions of interest to determine sensitivity of results to certain variables. One may want to study several different force levels for each side under various starting conditions, warning assumptions, and estimates of reliability. Taking all combinations of these variables can result, however, in hundreds of possibilities. If many replications of each are attempted for validating statistics, the computer requirements become excessive. Furthermore, there can be more results available than can humanly be usefully assimilated, even with computer-generated summaries. The recommended approach is to make a series of basic runs of the cases of greatest interest, plus a limited number of excursions from the basic conditions. This approach will provide just about the same amount of useful information with greatly reduced computer and analysis time.
GLOSSARY

Circular Error Probable (CEP): An indicator of the delivery accuracy of a weapon system, used as a factor in determining probable damage to a target. It is the radius of a circle within which half of the missiles/projectiles are expected to fall.

Computer Program: A program expressed in computer code designed to solve a class of problems, or specializing on a specific problem when appropriate parametric values are supplied.

Computerized War Gaming Model: A computer program, or series of programs, designed to simulate the logic of actions or interactions of a conflict situation and provide results for subsequent analysis.

Cross Targeting: The deliberate mixing of weapon types assigned to individual targets so that unexpectedly high failure rates for any specific weapon type, or group of weapons, will not result in a catastrophic failure of the war plan.

Damage Expectancy (DE): Probability of achieving a desired level of damage considering the probability of weapon arrival (PA) and the probability of damage (PD), i.e., \( \text{DE} = \text{PA} \times \text{PD} \).

Data Base: An organized collection of data records with similar or associated characteristics either to be operated upon by a system or contributing to the operation of a system.

Directing Assignment: A term used within QUICK to identify weapon-to-target assignments which are directed (fixed) by the user.

Dynamic: Pertaining to a quantity which is affected by time, energy, or power, and therefore indicates a relatively transient or unstable (changing) condition.

ESP Model: The Event Sequenced Program used by the Joint Strategic Target Planning Staff (JSTPS) to simulate large-scale strategic warfare.

Event: A happening in time, either within a simulation or in reality.

Expected Value: The average or mean value which would be obtained if a given event were repeated many times.

Fixed Assignments (weapon fixes): A term used within QUICK to identify weapon-to-target assignments which are directed (fixed) by the user.

FLAG: A code used in imposing weapon group restrictions within QUICK.

General War: Armed conflict between major powers in which the total resources of the belligerents are employed, and the national survival of a major belligerent is in jeopardy.
Input: Any factors, data, parameters, values, or instructions required for proper operation of a model or submodel to produce game results.

Limited War: Armed conflict short of general war, exclusive of incidents, involving the overt engagement of the military forces of two or more nations.

NEMO Model: The Nuclear Exchange Model maintained by the Navy for simulation of two-sided global nuclear war.

Nuclear Vulnerability Assessment: The estimation of probable or expected effects of hypothetical nuclear attacks on population, forces, and resources.

Optimizing: Selecting the most advantageous solution or course of action in a competitive situation within constraints imposed by the conditions of the problem.

Posture: Relative place or position; state or condition at a given time, especially in relation to other persons or things.

Probability of Arrival (PA): The probability of a delivery vehicle delivering a weapon which detonates as planned.

Probability of Damage (PD): The probability that damage will occur to a target expressed as a percentage or as a decimal.

RISOP: A hypothetical Red Integrated Strategic Offensive Plan.


Terminal AEM Defense: The ballistic missile defense provided for a single target or set of collocated targets by short-range defensive systems. QUICK uses a subtractive terminal defense model. Each incoming warhead or terminal decoy is assigned an interceptor until the local supply of defensive missiles is exhausted.
## DISTRIBUTION

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The CCTC Quick-Reacting General War Gaming System (QUICK) is used to generate missile and bomber plans suitable for strategic war gaming, provide statistical output summaries, and supply inputs to external simulators.

This document is a nontechnical description of QUICK that includes a broad description of system operation, input data requirements, available outputs, and

War Gaming, Resource Allocation
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typical applications.
QUICK is documented extensively in a set of Computer System Manuals (Series 9-77) published by the Command and Control Technical Center (CCTC), Defense Communications Agency (DCA), The Pentagon, Washington, DC 20301.