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User's Guide to the ARI-JRTC Mission Databases (Using JRTC I-MILES Data)

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for

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19. ABSTRACT (Continue on reverse if necessary and identify by block number) This report demonstrates the use of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) mission databases for the Joint Readiness Training Center at Fort Chafee, AR. It contains a general discussion of the types of data included in the databases, as well as general principles of variable naming. The text also contains a series of examples that use the INGRES query language to extract, categorize, and summarize data contained in the databases. It is intended as a learning guide for users of the database who wish to construct their own set of database queries associated with specific research requirements.				
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USER'S GUIDE TO THE ARI-JRTC MISSION DATABASES

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USER'S GUIDE TO THE ARI-JRTC MISSION DATABASES (Using JRTC I-MILES Data)

1.0 Purpose.

The purpose of this document is to familiarize the user of the ARI-JRTC mission databases with the current database structure and provide examples of INGRES queries when doing analysis with the training data. These examples will help readers construct their own queries once they understand the basics of developing queries on the mission databases. Appendix A contains a description of the JRTC mission database formats. If the reader is not familiar with the structure and content of the mission databases, it would be of value to refer to them now, before working through the exercises. The JRTC database structure is similar to the NTC mission database structure. If the user is already familiar with the NTC data structure, working with the JRTC databases should be simple.

We shall explore the principal linkages between the INGRES tables in the database: the Logical Player Number (LPN) and the Time of an event. Mission databases are 'event driven' because all the entries in the Fire Event Table (FET) and the Pairing Event Table (PET) result from actions initiated during the training exercise.

The purpose of this document is to provide a template to assist the researcher when designing a plan of analysis for a specific research issue. It is assumed that the reader will be familiar with using 'iquel' (an INGRES utility for interactive use of a database) and have knowledge of the training rotation under investigation ('iquel' is discussed in Ingres Release 6.0 for the VMS operating system, Volume I, Ingres Menu Users Guide, and the INGRES Reference manuals).

2.0 Gaining access to ARI databases.

If you are new to the Army Research Institute at the Presidio of Monterey and do not have an account on the VAX 11/780, then see the R & D Coordinator for a user account and password. The login procedure is:

```
Username:XXXXXXXXX
Password:XXXXXXX
```

At the '\$' prompt, enter the following:

```
$ quel <mission.ing >mission.lis aridms2
$ print mission/delete
```

These commands will print a catalogue of the mission databases for your reference. (Output is at the system line printer.) Databases beginning with the letter 'J' are JRTC database. Those beginning with an 'N' are NTC mission databases.

start_time	end_time	history	segmen	mtype	org	tf	airpl	gndpl	dbname
28 Nov 86 09:00:38	28 Nov 86 12:14:38	8703A1	005	D ATK	1-034 X 5-016	A	600	600	NAB870305
04 Dec 86 18:40:44	05 Dec 86 03:28:44	8703A1	017	RECON	1-034 X 5-016	A	600	600	NAB870317
26 Nov 86 18:40:44	27 Nov 86 03:11:09	8703A1	003	RECON	1-034 X 5-016	A	600	600	NAB870305
18 Jan 87 10:45:57	18 Jan 87 13:30:57	8704A0	024	MTC	1-040 X 4-006	A	600	600	NAA870424
15 Jan 87 20:07:59	16 Jan 87 00:42:59	8704A0	019	DEFBP	1-040 X 4-006	A	600	600	NAA870419

Any of the databases listed may be accessed by entering the following command:

\$ iquel dbname

where dbname is a valid database name from the catalogue listing.

A second, and simpler method of accessing mission databases is to use the Training Research Automated Catalog System (TRACS) software. (See Figure 1.) Missions can be queried through TRACS, which also provides the added functionality of providing the mission type, as well as a number of other criteria about the mission. See the TRACS Users Manual for further information about the program and the selection criteria available.

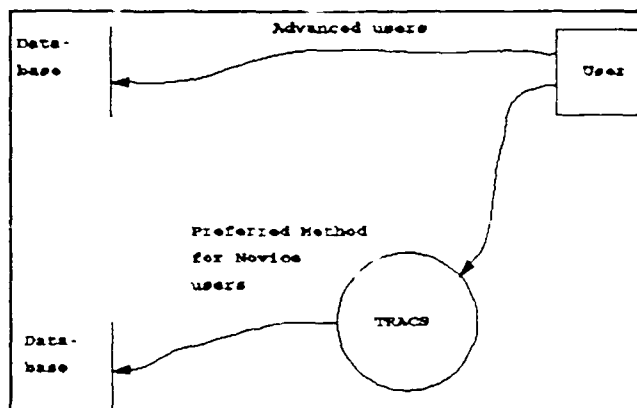


Figure 1 User methods of accession Mission Databases.

3.0 The Tables: Event data vs. Static data.

Our discussion begins with a distinction between 'event' and 'static' data. Events are those data that occurred in the field of play, such as a main gun round being fired. Think of events as 'what's going on' during a training mission. Static data defines the condition of the field and players during a training mission. Think of static data as 'what it looks like.' We will now expand on these concepts.

A good rule of thumb for recognizing an 'event' table is the presence of a time variable. The following tables have a time stamp with each event:

- 1) Fire Event Table (FET)
- 2) Pairing Event Table (PET)
- 3) Player State Update Table (PSUT)

All of the above tables can be linked logically by their time variable and give a chronological view of the training exercise.

Static tables support the event tables. They contain the condition and or state of the troops at the start of the training exercise. The following is a list of the static tables:

- 1) Player State Initialization Table (PSIT)
- 2) Player Vehicle Weapon Table (PVWT)

These tables help give the researcher an idea of the physical condition of the players and the battlefield during the training mission.

With a better understanding of Event and Static table types, we can investigate how to use the information in the different tables. We will begin with some simple examples of querying the database and progress to more complex techniques.

For a first example, let us determine the side (Opfor or Bluefor) of a firee (person being fired at) in the PET. We will need to look at the LPN of the firee in the PET and match it to the LPN in the PSIT (See Appendix A for a description of the variables within each database table).

Examples: The Pairing Event Table.

3.1 The Pairing Event Table (PET) is considered to be the heart of the JRTC research database. It is where the direct fire assessments are recorded on a player by player basis. Our first set of query examples will center around using the PET.

Example one matches the PET to the PSIT using the firee's logical player number as the thread between the two tables.

Example One: Finding the Force Code of the Firee

QUEL COMMANDS: _____

```
/* PET example # 1: Finding the force code of the firee (target) */
range of p is PET          /* Pairing Event Table */
range of q is PSIT         /* Player State Initialization Table */
retrieve (p.time,p.tlpn,p.result,q.side)
  where p.tlpn = q.lpn      /* match on logical player number */
  sort by p.time           /* maintain chronological order */
```

time	tlpn	result	side
04-Jun-90 14:15:44	161	N	O
04-Jun-90 14:15:47	161	N	O
05-Jun-90 11:24:42	153	N	O
05-Jun-90 11:24:48	153	N	O
05-Jun-90 11:24:57	153	K	O

o

```

o
o
| 06-Jun-90 04:02:08 | 178|N |O |
| 06-Jun-90 04:03:02 | 177|N |O |
| 06-Jun-90 04:33:46 | 104|N |O |
| 06-Jun-90 06:11:29 | 112|H |O |
| 06-Jun-90 06:23:22 | 112|N |O |
+-----+-----+-----+
(161 rows)
End of Request

```

The fields that are displayed are in the same order as they appear in the 'RETRIEVE' statement of the query. 'Time' refers to the time of the pairing event. 'TLPN' is the target's logical player number (the firee). 'RESULT' is the outcome of the engagement (H - hit, K - kill, N - near miss). 'SIDE' is the force code of the firee.

The last line of the query is a sort directive, which keeps the data in the same order as it occurred during the training exercise.

3.2. The next example builds upon the first in that we've added a third table to the query. We used a technique called 'pivoting', which uses the PSIT to point to a third table. The following diagram for example two may help visualize this concept.

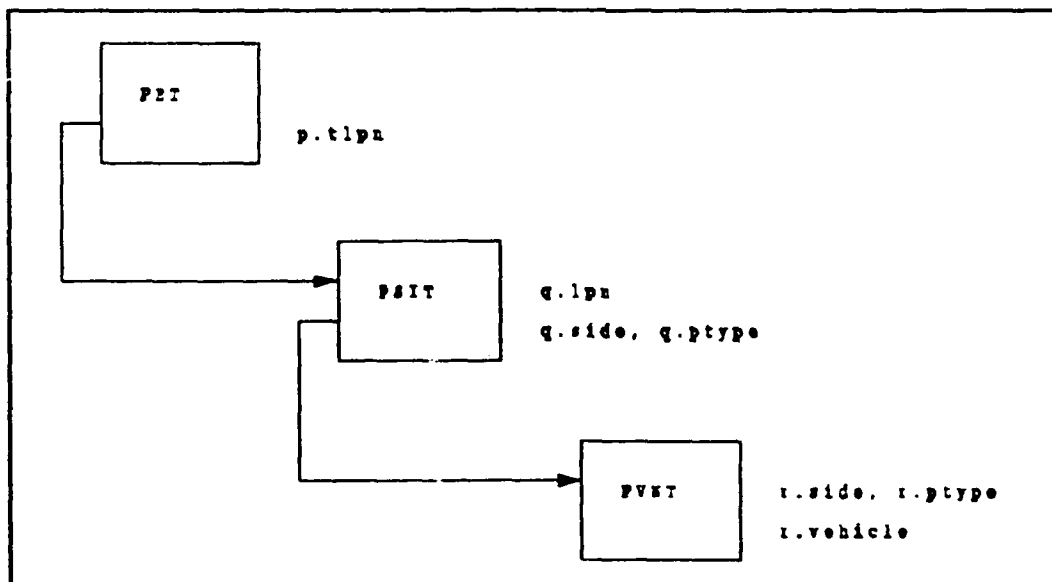


Diagram of example #2.

Example Two: Finding the Vehicle Type of the Firee.

QUEL COMMANDS:

```
/* PET example # 2: Finding the vehicle type of the firee using the */
/* PVWT (Player Vehicle Weapon Table) */
range of p is PET /* Pairing Event Table */
range of q is PSIT /* Player State Initialization Table */
range of r is PVWT /* Player Vehicle Weapon Table */
retrieve (p.time,p.tlpn,p.result,q.side,r.vehicle)
  where p.tlpn = q.lpn /* match on logical player number */
  and q.side = r.side /* match on player force code (of target) */
  and q.ptype = r.ptype /* match on player vehicle type */
  sort by p.time /* maintain chronological order */
```

time	tlpn	result	side	vehicle
04-Jun-90 14:15:44	161	N	O	BRDM
04-Jun-90 14:15:47	161	N	O	BRDM
05-Jun-90 11:24:42	153	N	O	T-62
05-Jun-90 11:24:48	153	N	O	T-62
06-Jun-90 03:57:07	7	N	O	BMP-1
06-Jun-90 04:02:08	178	N	O	BMP-1
06-Jun-90 04:03:02	177	N	O	BMP-1
06-Jun-90 04:33:46	104	N	O	BMP-1
06-Jun-90 06:11:29	112	H	O	BMP-1
06-Jun-90 06:23:22	112	N	O	BMP-1

(161 rows)

End of Request

The last field, 'vehicle,' comes from the PVWT and identifies the target vehicle's type.

3.3 Example three turns our attention to the firer, the player who pulled the trigger to cause the pairing. Because the JRTC uses the MILES laser system for simulating engagements, many times the firer is unknown to the target. This is reflected in the data, where only approximately twenty percent of the pairing events have a known firer. When the firer is known, his LPN is recorded in the field 'flpn' of the PET, otherwise the flpn is zero. We can use this fact to find those 'matched' pairing events in the PET. Example three is similar to example one, except now we seek information about the firer.

Example Three: Finding Rows Where the Firer is Known

QUEL COMMANDS:

```
/* PET example # 3: Finding rows where the firer is known */
range of p is PET /* Pairing Event Table */
range of q is PSIT /* Player State Initialization Table */
retrieve (p.time,p.flpn,p.result,q.side)
  where p.flpn = q.lpn /* match on logical player # (firer) */
  and p.flpn > 0 /* firers lpn is non zero */
  sort by p.time /* maintain chronological order */
```

time	flpn	result	side
05-Jun-90 14:27:38	188	H	O
05-Jun-90 14:44:25	185	N	O
05-Jun-90 14:45:00	185	N	O
05-Jun-90 15:14:35	187	K	O
05-Jun-90 15:14:37	100	N	B
05-Jun-90 15:15:18	187	K	O
05-Jun-90 15:17:08	187	K	O
05-Jun-90 15:19:12	187	H	O
05-Jun-90 16:25:48	185	N	O

(9 rows)

End of Request

3.4 For the sake of completeness, example four parallels example two, again with the exception that we are investigating the firer. The three-table query lists another variable in the PVWT, the firer's weapon as defined by the MILES code in the PET and translated by the PVWT.

Example Four: Finding Rows Where the Firer is Known

QUEL COMMANDS:

```
/* PET example # 4: Finding rows where the firer is known and */
/* determine the firer's vehicle and weapon types. */
/* Note that we can determine the side/ptype/miles of the firer */
/* and thus we can make a unique match in the PVWT */
/* */
range of p is PET /* Pairing Event Table */
range of q is PSIT /* Player State Initialization Table */
range of r is PVWT /* Player Vehicle Weapon Table */
retrieve (p.time,p.flpn,p.result,q.side,r.vehicle,r.miles)
  where p.flpn = q.lpn /* match on logical player # (firer) */
  and q.side = r.side /* match on force codes */
  and q.ptype = r.ptype /* match on player type codes */
  and p.miles = r.miles /* match on weapon codes */
```

```

and p.flpn > 0          /* firers lpn is greater than zero */
sort by p.time          /* maintain chronological order */

```

time	flpn	result	side	vehicle	miles
05-Jun-90 14:27:38	188	H	O	T-62	12
05-Jun-90 15:14:35	187	K	O	T-62	12
05-Jun-90 15:14:37	100	N	B	Non Vehicle	8
05-Jun-90 15:15:18	187	K	O	T-62	12
05-Jun-90 15:17:08	187	K	O	T-62	12
05-Jun-90 15:19:12	187	H	O	T-62	12

(6 rows)
End of Request

3.5 In our last example using the PET, we use a technique that allows us to look up both the firer and firee in the same query. It may not be obvious to the researcher, but there is only one LPN field in the PSIT, yet both the firer and firee have LPNs in matched pairings in the PET.

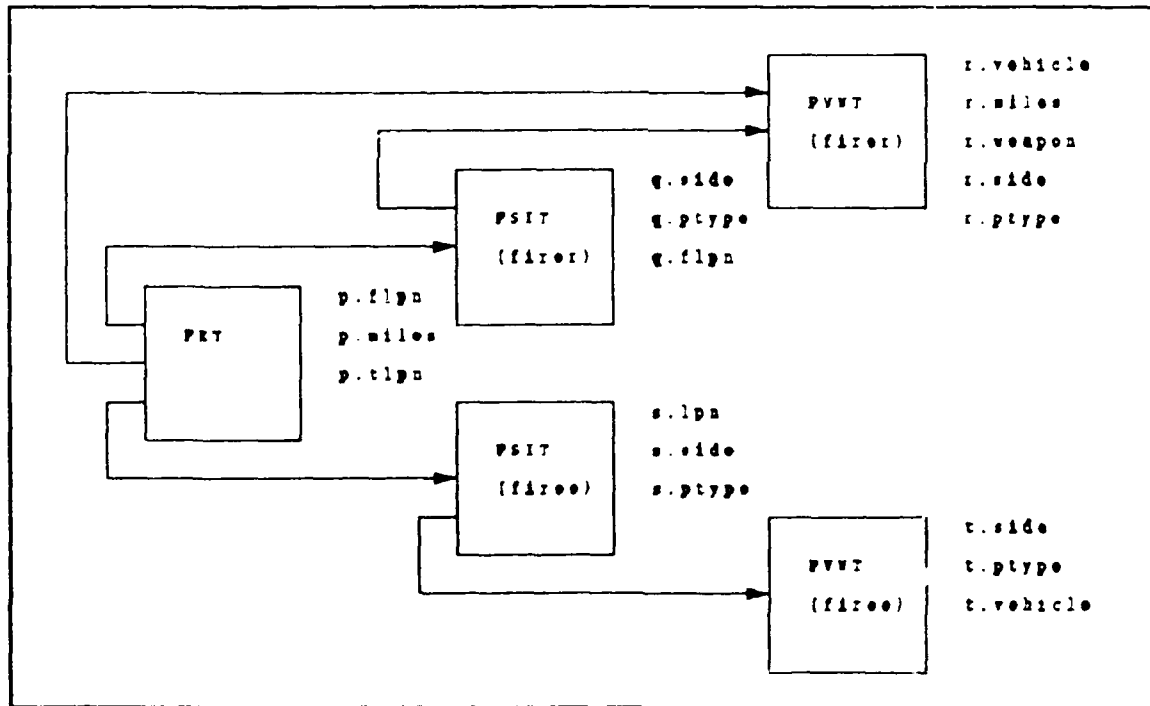


Diagram of Example #5.

Example Five: Combining the Queries in Examples 1-4.

QUEL COMMANDS: _____

```

/* PET example # 5: Combining the queries in examples 1 thru 4 we */
/* come up with a complete picture of the engagement */
/* */
range of p is PET /* Pairing Event Table */
range of q is PSIT /* copy for the firer relationships */
range of r is PVWT /* copy for the firer relationships */
range of s is PSIT /* copy for the firee relationships */
range of t is PVWT /* copy for the firee relationships */
retrieve
(p.time,p.tlpn,s.side,t.vehicle,p.flpn,p.result,q.side,r.vehicle,r.miles)
  where p.flpn = q.lpn /* match on logical player # (firer) */
    and q.side = r.side /* match on force codes (firer) */
    and q.ptype = r.ptype /* match on player type code (firer) */
    and p.miles = r.miles /* match on weapon codes (firer) */
    and p.flpn > 0 /* firers lpn is greater than zero */
    and p.tlpn = s.lpn /* match on logical player # (firee) */
    and s.side = t.side /* match on force codes (firee) */
    and s.ptype = t.ptype /* match on player type codes (firee) */
    and p.frat = "N" /* omit fratricides */
  sort by p.time /* maintain chronological order */

```

```

+-----+-----+-----+-----+-----+-----+-----+-----+
|time      |tlpn |side |vehicle |flpn |result|side |vehicle |miles |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 05-Jun-90 15:14:37 | 187|0  |T-62  | 100|N  |18  |Non Vehicle | 81
+-----+-----+-----+-----+-----+-----+-----+-----+
(1 row)
End of Request

```

Appendix A - Mission Database Structure

This Appendix documents the format of the JRTC Mission Database. Mission Databases include all relevant data from the I-MILES data collected at the JRTC.

A.1 JRTC Mission Databases

Each Mission Database contains 6 tables:

- (1) Mission Identification Table (MID),
- (2) Player State Initialization Table (PSIT),
- (3) Player State Update Table (PSUT),
- (4) Player/ Vehicle/ Weapon Code Table (PVWT),
- (5) Firing Event Table (FET),
- (6) Pairing Event Table (PET)

The table types and their compositions were chosen to allow for the inclusion of the maximum amount of information in a format which facilitates access for the kinds of research issues that have been defined to date. The table descriptions have been kept as simple as possible to allow review of the structure and content without overwhelming the reviewer with reams of documentation.

A rotation at the JRTC is a three-week period of time when a battalion (usually a Light force) trains at Ft. Chaffee, Arkansas. The rotation is divided into phases.

A separate database is generated for each phase. The database name is a nine-character code constructed as follows:

Character 1 - For the mission databases derived from NTC data, 'N'. For mission databases derived from JRTC data, 'J'.

Character 2 - 'L' for light force.

Character 3 - A code letter (A=1,B=2,C=3,...) specifying the phase.

Characters 4,5 - Fiscal Year (1 Oct - 30 Sept).

Characters 6,7 - Rotation sequence number (01-14).

Characters 8,9 - The iteration or sequence number of the scenario being played.

A.2 Description of JRTC Mission Database Tables

This section describes the contents of each table in the Mission Database. It includes the explicit layout, element by element, for each of the six tables.

A.2.1 Mission Identification Table (MID)

The Mission ID table provides all information required to completely identify and categorize a mission segment.

Element Name	Element Description	Units
START_TIME	Mission start date and time	20 Char
END_TIME	Mission end date and time	20 Char
HISTORY	History Name	10 Char
SEGMENT	Segment Number	1 Integer
MTYPE ¹	Mission Type	20 Char
ORG	Unit ID	20 Char
TF	L(ight)	1 Char

mid table

start_time	end_time	history	segment	mtime	org	tf
04-Jun-89 13:30:00	06-Jun-89 15:30:00	8906	1	3 DEF BP	11-29INF	1L

(1 row)

End of Request

A.2.2 Player State Initialization Table (PSIT)

This table describes the player list at the beginning of the mission segment. It includes all players, Opfor, Bluefor, and White.

Element Name	Element Description	Units
PID	Player identification (Bumper number)	3 Char
LPN ²	Logical Player Number	2 Integer
SIDE	B(ue), O(pfor), or W(hite)	1 Char
INST	I(nstrumented) or N(ot instrumented)	1 Char
ACTIVE	0 - undetermined, 1 - Active, 2 - Not active	1 Integer
PTYPE	Player Type Code (See PVWT Table)	1 Integer
ORG	Next higher Line Unit	20 Char
TRACK	T(racked) or U(ntracked) by RDMS	1 Char

¹ The Mission Type will be Defend Sector, Defend BP, Recon, Move To Contact (MTC), H(asty) ATK, D(eliberate) ATK, or C(ounter) ATK.

² The Logical Player Number (LPN) is a unique index used by the realtime system.

PSTAT³ Player Status Code

1 Integer

psit table

pid	lpn	side	inst	active	ptype	org	track	pstat
		2 O	I		0	16 B/1-116I	T	1
		4 B	I		0	15 C/1-116I	T	1
		6 O	I		0	16 A/1-116I	T	1
		7 O	I		0	5 131 MRR	T	1
		8 O	I		0	7 513 73TK	T	1
		9 O	I		0	16 C/1-116I	T	1
		10 O	I		0	16 A/1-116I	T	1
		13 O	I		0	16 C/1-116I	T	1
o								
o								
o								
		187 O	I		0	7 526 73TK	T	1
		188 O	I		0	7 533 73TK	T	1
		194 O	I		0	16 A/1-116I	T	1
		197 O	I		0	5 MRR	T	1

(117 rows)

End of Request

A.2.3 Player State Update Table (PSUT)

The Player State Update table tracks changes to all players throughout the duration of the mission segment. Fields that are subject to update are SIDE, INST, PTYPE, ORG, TRACK and PSTAT.

Element Name	Element Description	Units
TIME	Date and Time of Update	20 Char
PID	Player identification (Bumper number)	3 Char
LPN	Logical Player Number	2 Integer
SIDE	B(lue), O(pfor), or W(hite)	1 Char
INST	I(nstrumented) or N(ot instrumented)	1 Char
PTYPE	Vehicle Type Code (See PVWT Table)	1 Integer
ORG	Next higher Line Unit	20 Char
TRACK	T(racked) or U(ntracked) by RDMS	1 Char
PSTAT ³	Player Status Code	1 Integer

³ The player status codes are :

- | | |
|-------------------------|-----------------------|
| 1 : Operational | 2 : Combat Loss |
| 3 : OC Gun Kill | 4 : Accidental Kill |
| 5 : Administrative Kill | 6 : Mechanically Down |
| 7 : Mobility Kill | |

psut table

time	pid	lpn	side	inst	ptype	org	track	pstat
06-Jun-90 07:11:01		98 B	I		15 A/1-116I		T	1
06-Jun-90 07:11:02		98 B	I		15 A/1-116I		T	4
06-Jun-90 07:11:02		98 B	I		15 A/1-116I		T	1
					o			
					o			
					o			
06-Jun-90 11:25:09		153 O	I		7 514 73TK		T	1
06-Jun-90 12:13:52		188 O	I		7 533 73TK		T	3
06-Jun-90 12:13:56		188 O	I		7 533 73TK		T	1
06-Jun-90 12:20:16		113 O	I		25 569 73TK		T	3
06-Jun-90 12:20:23		113 O	I		25 569 73TK		T	1

(397 rows)

End of Request

A.2.4 Player/ Vehicle/ Weapon Code Table (PVWT)

The Weapon Code table defines a unique code for each weapon present on the battlefield. The codes allow correlation of MILES codes, vehicle types, and weapons. The PVWT is static; it doesn't change from database to database. A listing of the PVWT table is included as Section A.2.4.1.

Element Name	Element Description	Units
SIDE	Side Code O(pfor) or B(bluefor)	1 Char
PTYPE	Player Type Code	1 Integer
VEHICLE	Vehicle Description	15 Char
MILES	MILES Weapon Code	1 Integer
WEAPON	Weapon description	15 Char
IAMMO	Initial Ammunition Load (not used)	2 Integer

pvwt table

side	ptype	vehicle	miles	weapon	iammo
B		1 M1		16 105mm Main Gun	0
B		2 M1A1		16 105mm Main Gun	0
O		3 T-80		10 125mm Main Gun	0
O		3 T-80		27 Machine Gun	0
B		1 M1		27 Machine Gun	0
B		2 M1A1		27 Machine Gun	0
B		4 M551		13 152mm Main Gun	0
B		4 M551		7 TOW	0
B		4 M551		27 Machine Gun	0

O	5	BMP-1	14	73mm PKT	0
O	5	BMP-1	3	AT-3	0
O	5	BMP-1	27	Machine Gun	0
O	6	T-55	12	115mm Main Gun	0
O	6	T-55	27	Machine Gun	0
O	7	T-62	12	115mm Main Gun	0
O	7	T-62	27	Machine Gun	0
O	8	T-72	10	125mm Main Gun	0
O	8	T-72	27	Machine Gun	0
B	9	M2	22	25mm	0
B	9	M2	7	TOW	0
B	9	M2	27	Machine Gun	0
B	10	M3	22	25mm	0
B	10	M3	7	TOW	0
B	10	M3	27	Machine Gun	0
O	11	BMP-2	23	23mm	0
O	11	BMP-3	3	AT-3	0
O	11	BMP-3	27	Machine Gun	0
B	12	Non Vehicle	7	TOW	0
B	13	M901-T	7	TOW	0
O	14	BRDM-T	3	AT-3	0
B	15	Non Vehicle	8	DRAGON	0
O	16	Non Vehicle	15	AT-4	0
O	17	Non Vehicle	9	RPG-7	0
O	18	Non Vehicle	9	RPG-16	0
O	19	Non Vehicle	20	RPG-22	0
O	20	Non Vehicle	14	73mm PKT	0
B	21	Non Vehicle	24	50 Cal	0
O	22	Non Vehicle	25	14.5mm	0
O	23	Non Vehicle	19	AGS-17	0
B	24	M113	0	Non Weapon	0
O	25	ZSU-23-4	22	23mm	0
O	26	BRDM	0	Non Weapon	0
B	27	HMMWV	0	Non Weapon	0

(43 rows)
End of Request

A.2.5 Firing Event Table (FET)

This table will maintain a time-ordered record of all legitimate firings recorded by the I-MILES system. The last column, ammo, is included so as the table structure will be compatible with the NTC databases, and is always zero.

Element Name	Element Description	Units
TIME	Date and Time of Fire Event	20 Char
PID	Player ID (Bumper Number)	3 Char

LPN	Logical Player Number	2 Integer
MILES	MILES Weapon Code (See PVWT)	1 Integer

fet table

time	pid	lpn	miles
06-Jun-90 01:57:23		70	15
06-Jun-90 06:45:37		70	0
06-Jun-90 05:55:27		29	15
06-Jun-90 05:56:14		29	15
06-Jun-90 03:58:58		188	27
06-Jun-90 04:02:21		188	27
05-Jun-90 12:20:05		113	22
05-Jun-90 12:20:25		113	22
06-Jun-90 05:35:18		113	22

(122 rows)
End of Request

A.2.6 Pairing Event Table (PET)

The Pairing table will maintain a time-ordered record of legitimate pairing events. This table will also contain information relating to the firer if the pairing event can be matched with a fire event.

Element Name	Element Description	Units
TIME	Date and Time of Pairing	20 Char
TPID	Target ID (Bumper Number)	3 Char
TLPN	Target LPN	2 Integer
RESULT	N(ear miss), H(it), K(ill)	1 Char
FPID	Firer ID (Bumper Number)	3 Char
FLPN	Firer LPN	2 Integer
MILES	Firer Weapon Type (MILES - See PVWT)	1 Integer
FRAT	Fratricide Indicator (Y/N)	1 Char

pet table

time	tpid	tlpn	result	fpid	flpn	miles	frat
05-Jun-90 11:47:52		156	N			0	28
05-Jun-90 11:48:01		156	N			0	28
05-Jun-90 11:49:16		156	N			0	28
05-Jun-90 11:49:30		156	N			0	28

05-Jun-90 11:49:34		156 N			0	28 N	
05-Jun-90 11:49:34		156 K			0	0 N	
05-Jun-90 13:43:30		168 N			0	28 N	
05-Jun-90 14:06:15		168 N			0	28 N	
05-Jun-90 12:13:49		188 N			0	28 N	
05-Jun-90 12:13:52		188 K			0	0 N	
05-Jun-90 12:20:09		113 N			0	28 N	
05-Jun-90 12:20:13		113 N			0	28 N	
05-Jun-90 12:20:16		113 K			0	0 N	

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(225 rows)
End of Request
