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## **HAZARD DIVISION 1.2 TESTS - INSTRUMENTATION RESULTS AND INTERPRETATION**

BY MICHAEL M. SWISDAK, JR. AND KENT W. RYE

WEAPONS RESEARCH AND TECHNOLOGY DEPARTMENT

9 MARCH 1994

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**NAVAL SURFACE WARFARE CENTER**  
**DAHLGREN DIVISION • WHITE OAK DETACHMENT**

Silver Spring, Maryland 20903-5640

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## FOREWORD

This work was jointly sponsored by the United Kingdom Explosives Storage and Transport Committee (ESTC) and the United States Department of Defense Explosives Safety Board (DDESB).

The program was, truly, a team effort. The fielding at the Naval Air Warfare Center, Weapons Division, China Lake, California, was under the direction of Mr. Carl Halsey. The airblast/temperature measurements and analyses were made by the Explosion Damage Branch (Code R14) of the Dahlgren Division of the Naval Surface Warfare Center. The fragmentation/debris collection and analysis was under the direction of Mr. W. D. Houchins of the Explosion Dynamics Branch (Code G64) also of this Division.

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The mention of proprietary or company names in this report is for technical information purposes only. No endorsement or criticism is intended.

Approved by:

  
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## **ABSTRACT**

To date, nearly all efforts in the field of accidental explosion consequence determination have been aimed at the quantification of the effects of a Hazard Division (HD) 1.1 event. Little attention has been paid to the consequences of the ignition of stacks of HD 1.2 ammunition. In 1989, NATO AC/258 (Group of Experts on the Safety Aspects of Transportation and Storage of Military Ammunition and Explosives) agreed that a program of trials should be carried out to investigate the consequences of an HD 1.2 event. The goal of these trials would be twofold: to gain basic knowledge about HD 1.2 phenomena and to revise the current NATO quantity-distance relationships for HD 1.2 events.

As a result of the NATO interest, a joint United Kingdom/United States (UK/US) experimental program was started in 1990. To date, six tests have been conducted: three single-pallet tests (30 projectiles/test), two 8-pallet tests (240 projectiles/test), one 27-pallet test (864 projectiles). This report describes the test program and the instrumentation used and summarizes the instrumentation results which have been obtained.

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## **CHAPTER 1**

### **INTRODUCTION**

To date, nearly all international effort in the field of accidental explosion consequence determination has been aimed at the quantification of the effects of a Hazard Division (HD) 1.1 (mass detonation) event in an explosives storage facility. Tests such as those carried out in Australia,<sup>1-4</sup> France,<sup>5</sup> and the United States<sup>6-9</sup> over recent years have assessed the effects of blast and fragment throw from accidental mass explosions in brick and concrete storehouses, igloos, and tunnel magazines.

Little attention has been paid to quantifying the consequences of the accidental initiation of HD 1.2 ammunition. This class of ammunition is not expected to explode en masse. Individual rounds or small groups of rounds will explode when sufficiently stimulated (by, for example, fire) without causing others around them to explode. Such explosions will continue spasmodically over a period as further rounds receive sufficient stimulus.

In 1989, NATO AC/258 (Group of Experts on the Safety Aspects of Transportation and Storage of Military Ammunition and Explosives), acknowledging the frailty of the basis for their HD 1.2 Quantity-Distances (Q-Ds), agreed that a program of trials should be carried out to investigate the consequences of an accidental HD 1.2 event. Exposed stack trials and trials within typical storehouse structures were proposed. This program would also offer the opportunity for the development of an approach common to and acceptable to NATO, the United Kingdom (UK), and the United States (US) for the calculation of HD 1.2 safety distances.

To enable the program of trials to proceed in a short time scale, the UK Explosives Storage and Transport Committee (ESTC) and the US Department of Defense Explosives Safety Board (DDESB) agreed to finance jointly an initial series of trials to examine the consequences of the accidental ignition of stacks of HD 1.2 ammunition in the open.

This report describes the testing methodology, the test program, and the instrumentation which was used on the tests, and presents the instrumentation results. The fragmentation/debris collection and interpretation will be discussed in a separate report.

## CHAPTER 2

### TEST PROGRAM

The test program consists of a series of bonfire tests on various sized stacks of HD 1.2 items stored in the open. Six tests have been completed in this phase of the testing program. The test details are presented in Table 2-1. All of these tests were conducted at the Naval Air Warfare Center, Weapons Division, China Lake, California.

#### TEST ITEM

The ammunition which has been tested to date is the M1 105mm cartridge. This is a semi-fixed, high-explosive artillery round. The projectile body is fabricated from forged steel and weighs approximately 25.8 pounds. An aluminum shipping plug is assembled into the nose of the projectile in lieu of a fuze. The propelling charge is comprised of approximately 3 pounds of M1 propellant contained in a spiral wrap steel case. Each propelling charge case weighs approximately 4.7 pounds and is made of brass. All of the tests which are being described in this report used TNT as the explosive fill.

The cartridges are packaged in wooden boxes for transport and storage. Each box contains two cartridges that are oriented such that the projectile of one cartridge is adjacent to the propelling charge of the other cartridge (i.e., nose-to-tail arrangement). A complete pallet consists of 15 or 16 boxes, depending on the stacking arrangement. The boxes are secured on the pallet using steel banding.

#### TEST METHOD

The first four tests were conducted generally in accordance with the methodology prescribed in the *UN Recommendations on the Transport of Dangerous Goods, Tests and Criteria (Second Edition)* (the UN Orange Book).<sup>10</sup> The test items were stacked on a test stand that provided approximately 30 inches of clearance between the bottom of the stack and the ground level. Dried lumber placed beneath the test stand and around the pallets was used as kindling to provide fuel during the initial stages of the test. Four shallow troughs containing a small amount of gasoline were placed around the base of the stack to provide an ignition source for the fire. The gasoline in the troughs was ignited with an electric squib. In order to eliminate ground

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cratering and burrowing of unexploded test items in the ground zero area, the stack and bonfire were constructed over a steel plate that was supported by a concrete pad.

The fifth and sixth tests were conducted in a similar manner except that the kindling was placed beneath the test stand only. This was done to simulate a more probable accident scenario in which the test item packaging and the energetic components are the primary fuel source for a fire.

TABLE 2-1. TEST INFORMATION

| TEST NUMBER | NUMBER OF<br>PALLETS | BOXES PER<br>PALLET | NUMBER OF<br>ROUNDS | TEST DATE | INSTRUMENTATION                    |
|-------------|----------------------|---------------------|---------------------|-----------|------------------------------------|
| 1           | 1                    | 15                  | 30                  | 7-May-91  | photography                        |
| 2           | 1                    | 15                  | 30                  | 24-Jun-91 | photography, airblast              |
| 3           | 1                    | 15                  | 30                  | 29-Jul-91 | photography, airblast              |
| 4           | 8                    | 15                  | 240                 | 29-Oct-91 | photography, airblast              |
| 5           | 8                    | 15                  | 240                 | 29-Apr-92 | photography, airblast              |
| 6           | 27                   | 16                  | 864                 | 28-Oct-92 | photography, airblast, temperature |

## **CHAPTER 3**

### **INSTRUMENTATION**

#### **AIRBLAST**

This chapter describes the transducers and instrumentation that were used during the HD 1.2 Tests. The first five tests, tests 1 through 3 (single pallet of projectiles) and tests 4 and 5 (eight pallets of projectiles), used eight pressure gauges located at the 0 and 90 degree radii as shown in Figure 3-1. Four gauges were located on each radii at nominal ranges of 50, 70, 100, and 200 feet from the center of the pallet or stack of pallets. Each gauge was mounted 2 feet above the ground. Gauge positions were labeled P1 through P8 as shown in Figure 3-1.

Test 6, using 27 pallets of projectiles, used 12 pressure gauges located along the 0, 90, and 225 degree radials as shown in Figure 3-1. Four gauges were located on each line at nominal ranges of 50, 70, 100, and 200 feet from ground zero. Gauge positions were labeled P1 through P12 for this test. Also during test 6, a fiber optic zero time transducer was used so that the projectiles' initiation time could be determined. This will be discussed in more detail below.

The pressure gauges that were used during the tests are the Atlantic Research Corporation Blast Pressure Gauge Model LC-33. The sensing element is piezoelectric and mounted in a "pencil" type housing as shown in Figure 3-2. The output of the gauge is connected to a source follower amplifier (PCB Model 402A02) located near the gauge. The PCB source follower amplifier is powered and conditioned through the PCB Power Unit Model 494A06. The gauge-amplifier was located approximately 600 feet from the power unit and recording system. The overall frequency response of the gauge and conditioning system is 0.5 to 100,000 Hz.

#### **FIBER OPTIC ZERO TIME SENSOR**

During the 27 pallet test (test 6), a zero time fiber optic sensor was used to determine the initial reaction time of each event. The fiber optic zero time sensor consisted of four parts: (1) fiber optic input block, (2) interconnecting fiber optic cable, (3) photoconductor, and (4) amplifier and filter. Figure 3-3 shows the fiber optic input block and a schematic of the photoconductor-amplifier circuit. The fiber optic input block was configured in this way in order to expand the sensor's field of view. The optic sensor used was the Clairex CL-704L photoconductor. This was used mainly because of its availability and because of its low resistance characteristics. The Texas Instruments TI-054 operational-amplifier was used at a gain of approximately 1000. The circuit also has a high pass filter set to 2,000 Hz, removing the slower

intensity changes of the cook-off fire from the dynamic flare-up produced by each event.

## TEMPERATURE

On test 6 (27-pallet test), an attempt was made to measure the temperature on both the outside and inside of several of the boxes. High temperature Type K thermocouples were used. The locations of these sensors are shown in Figure 3-4.

The thermocouples were connected to an Analog Devices AD595 thermocouple amplifier with a built-in cold junction compensator. The circuit was packaged and buried approximately 30 feet from the center of the pallet stack. The output of the amplifiers were connected to a Honeywell Model 101 (HW101) FM tape recorder located approximately 600 feet away. Time code was also recorded on the tape so that the temperature data could be coordinated with the blast data. The tape recorder was operated at a speed of 15 inches per second (ips) which gave a recording time of approximately 2 hours and a frequency response of DC to 10 KHz. The recorder was operated manually and was turned on before leaving the test site.

## REMOTE INSTRUMENTATION FLOAT SYSTEM

The pressure measurements were recorded remotely using a radio controlled instrumentation system. The instrumentation system was designed originally for recording shockwave measurements near large underwater explosions; it was designed to be placed on a remote floating platform. Thus it is named the Remote Instrumentation Float (RIF) System. Appropriate modifications were made in order to meet the requirements of the HD 1.2 tests. A remote controlled recording system was required because of the lack of appropriate shelter for instrumentation and personnel at the test site. Tests 1 through 3 used one RIF System and tests 4 through 6 used two systems. Two systems were required because a single system had a recording duration that was potentially too short to record the complete test. Thus, two RIF Systems were used in series with a short time of recording overlap.

The RIF System is a rugged, shock mounted, air-conditioned, self-contained recording system. The instrumentation can be powered with battery/inverter systems or a portable generator. The overall RIF System is shown in block diagram form in Figure 3-5. The RIF System is controlled by a master remote control station that sends commands and receives the remote RIFs' status reports through dual tone multi-frequency encoded radio transmissions. Five-watt Motorola PT500 FM transceivers are used for these transmissions. During this test series, the recording system was controlled from a distance of approximately 4000 feet.

The FM tape recorder used in the RIF System is the HW101. During the tests, the recorder was set for Wideband I recording and the data was recorded at 30 ips to give a frequency response of DC to 20 KHz. The 9600-foot tapes which were used during the tests gave approximately 58 minutes of recording time. The HW101 is operated in the remote mode which enables operation of front panel controls through the remote connector. Through this connector, the HW101's status is also monitored.

The RIF System is powered by two sets of battery/inverter systems for DC and AC power. One set has two 80-ampere-hour batteries and an inverter that supplies power to the data collection electronics; power is switched on by the remote control electronics, and the batteries operate for 60 minutes. The other set has a 40-ampere-hour battery and inverter that supplies power to the remote control electronics for up to 10 hours of operation. The RIF System can also be powered by a portable gasoline powered generator. Due to the long recording times required for these tests, generators were mostly used.

## DATA REDUCTION

Data reduction of the information recorded during testing was done at the Naval Surface Warfare Center White Oak Detachment (NSWCWODET). Tests 1 through 5 were analyzed using a Hewlett Packard HP1000A minicomputer system that digitizes and processes data previously recorded on analog tape recorders. These systems provide laserjet plots along with the capability of providing ASCII data files that can be used on personal computers. A block diagram of the system is shown in Figure 3-6. The computer system was recently upgraded and expanded to include four Hewlett Packard HP9000/700 series workstations and Kinetic Systems transient recorders/digitizers. This system was used for digitizing and processing the data for test 6. Also incorporated in the data reduction system was a time code reader with a time code latch circuit. The time code latch circuit freezes the time code reader display when a signal is input into the circuit. Thus, when the trigger latch circuit was connected to a recorder data channel output, the shockwave signal would latch time code and show the time the event occurred.

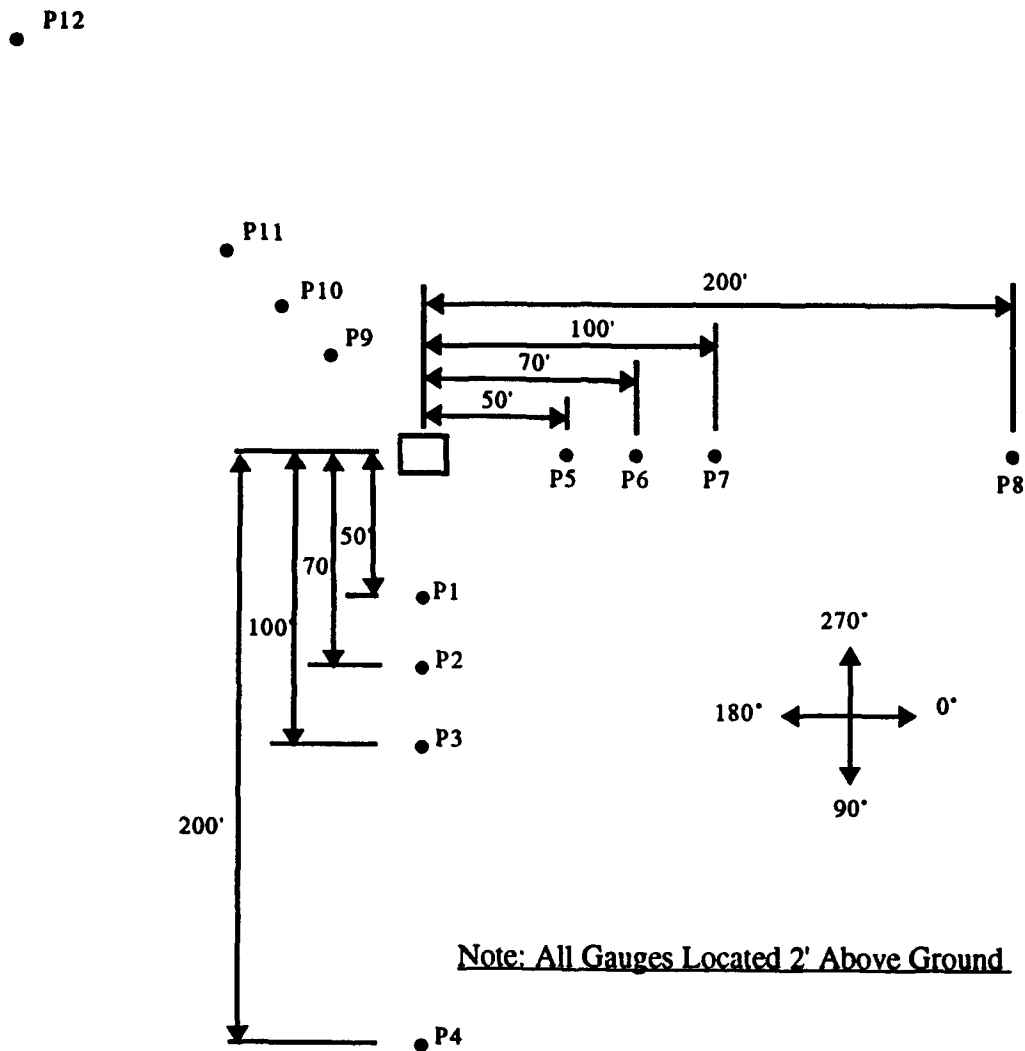


FIGURE 3-1. PRESSURE GAUGE LOCATIONS

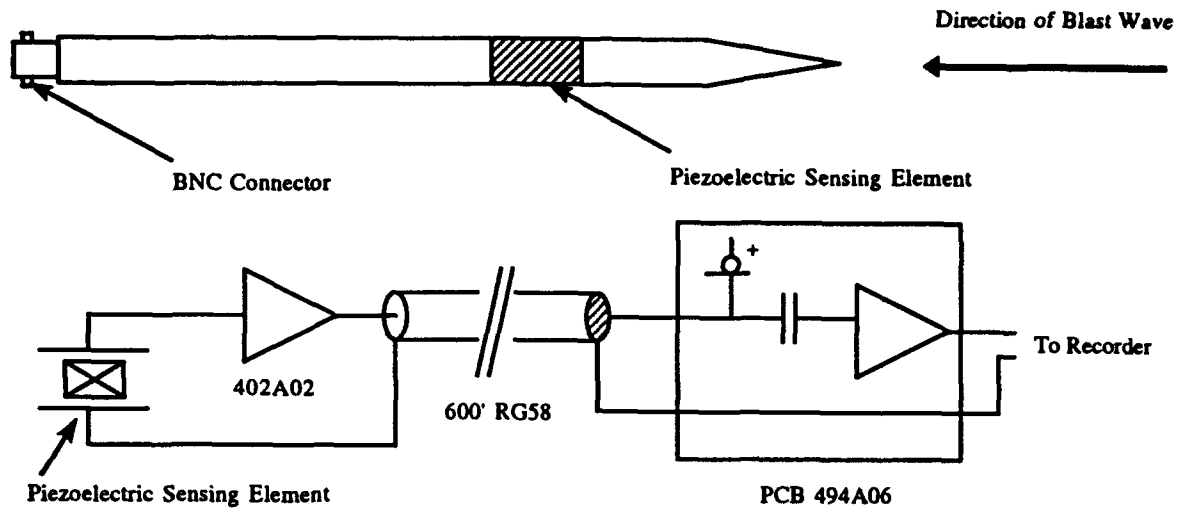


FIGURE 3-2. MODEL LC-33 PRESSURE GAUGE AND CIRCUIT SCHEMATIC

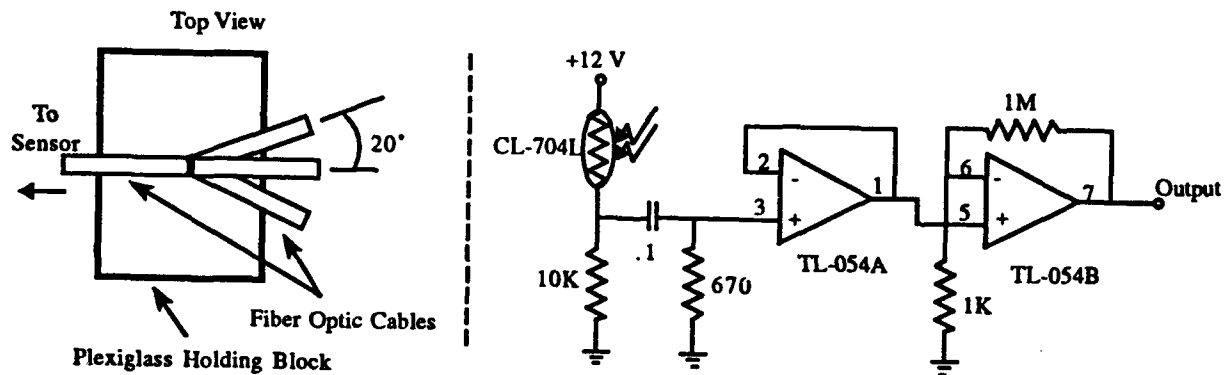


FIGURE 3-3. FIBER OPTIC INPUT BLOCK AND CIRCUIT SCHEMATIC

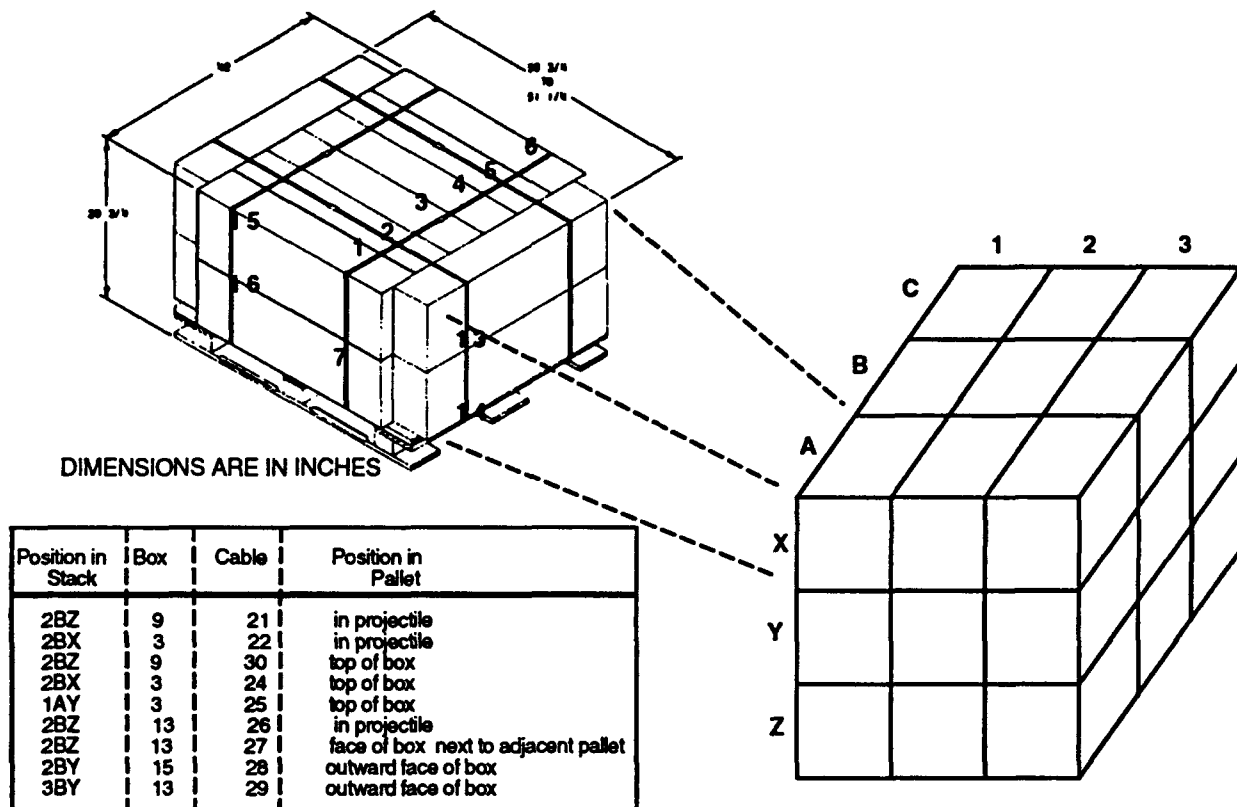


FIGURE 3-4. THERMOCOUPLE LOCATIONS

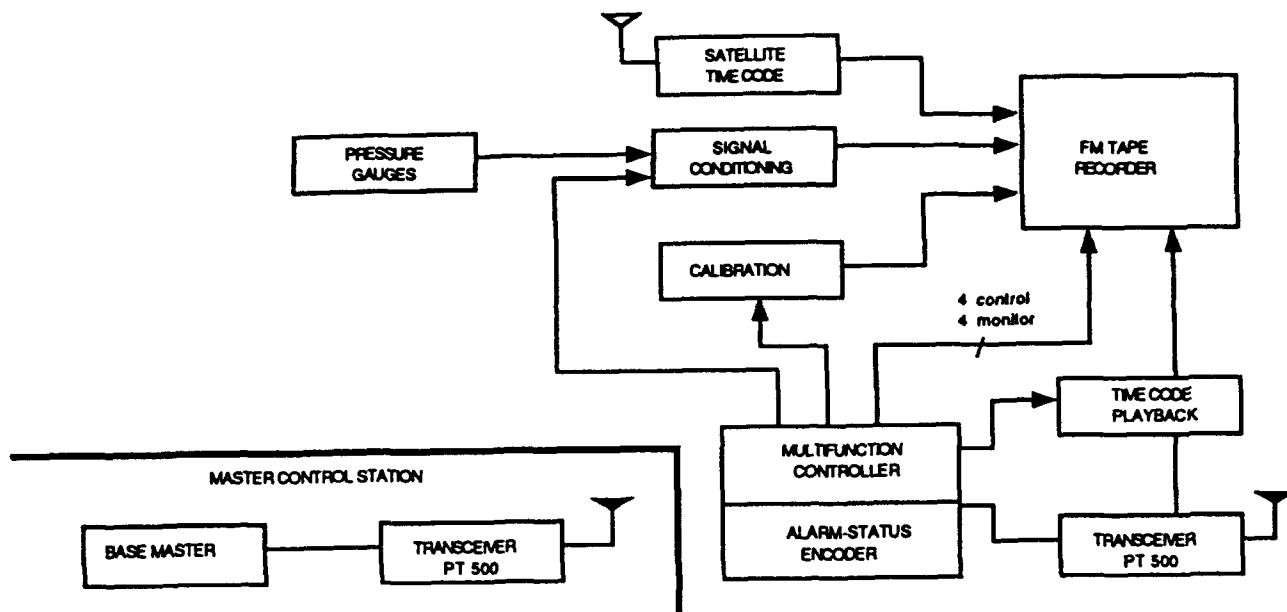


FIGURE 3-5. RIF SYSTEM BLOCK DIAGRAM

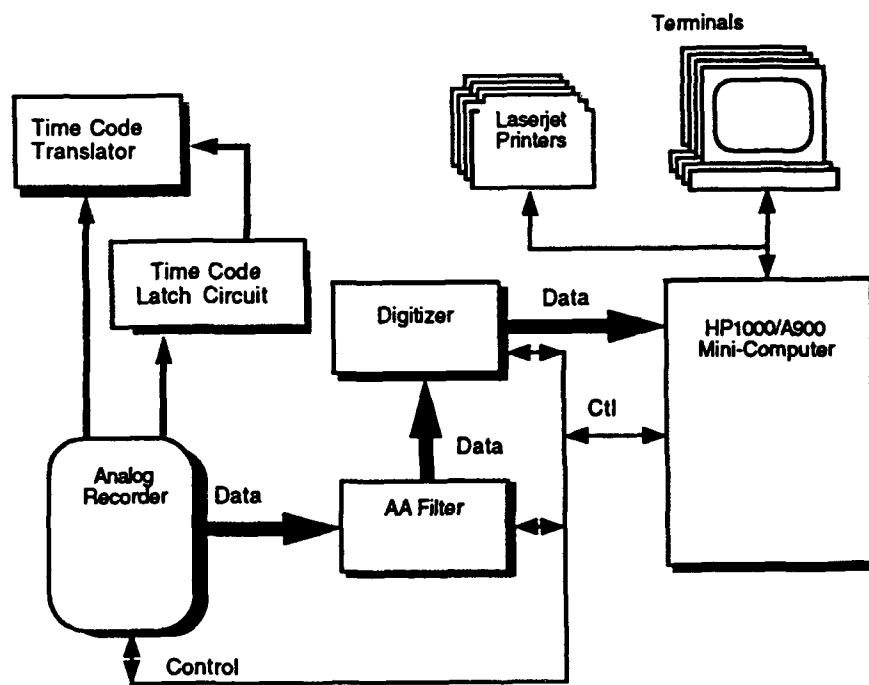


FIGURE 3-6. DATA REDUCTION COMPUTER SYSTEM

## CHAPTER 4

### RESULTS

This chapter presents the instrumentation results which have been obtained to date during this testing effort. The data will be presented in the following sequence for each test. First, a table showing the event time of each reaction--referenced to Standard IRIG Time Code. Also included on this table are the event times recorded by an on-site observer and the elapsed times computed from the event times. Next, a table presenting the airblast peak pressures as a function of position for each event. For test 6, two additional tables will be presented--one presenting arrival times and derived event locations for each event and one presenting the temperatures which were recorded.

Selected pressure-time waveforms will be presented for each test. All of the temperature-time records which were recorded during test 6 will also be presented.

#### TEST 1

This test was of a single pallet of projectiles (total of 30 projectiles) and was conducted in May 1991. Due to shipping problems, the instrumentation did not arrive at the test site in time. Therefore, there are no airblast data for this test. Table 4-1 presents the event times which were determined from a video taken during the event. Thirteen events were recorded and seventeen projectile bodies were recovered--accounting for all 30 projectiles.

#### TEST 2

The second test was also a single pallet of projectiles; it was conducted in June 1991. Nine events or major reactions were recorded on this test. Table 4-2 presents the times of each of these events--relative to both the start of the fire and the first major reaction. The peak pressures from the nine reactions are shown in Table 4-3. A true zero-time for each event was not available; zero time for events 2 through 9 were arbitrarily referenced to 20 ms before gauge P2. No signal was received from gauge P1. Since no zero time was available, shock arrival time at each position and, hence, event location, could not be determined. Nine events were recorded; 21 projectile bodies were recovered--accounting for all 30 projectiles.

### TEST 3

The third test involved a single pallet of projectiles and was conducted on 29 July 1991. Eleven events or major reactions occurred on this test. However, the last two events happened after the shutdown of the tape recorder (more than 1 hour after the start of the fire). Table 4-4 presents the times of each of the first nine events--relative to both the start of the fire and the first major reaction. The peak pressures from the nine reactions that were recorded are shown in Table 4-5. A true zero-time for each event was not available; zero time for events 1 through 8 were arbitrarily referenced to 25 ms before gauge P2. Zero time for event 9 was referenced to 10 ms before gauge P5. Since no zero time was available, shock arrival time at each position and, hence, event location, could not be determined. Eleven events were recorded; 19 projectile bodies were recovered--accounting for all 30 projectiles.

### TEST 4

The fourth test consisted of eight pallets of projectiles (total of 240 projectiles) and was conducted on 29 August 1991. Following the test, 174 projectile bodies were recovered intact--indicating that 66 projectiles had reacted. Based on the on-site observations and the pressure instrumentation, 68 events or major reactions occurred. Table 4-6 presents the times of each of these events--relative to both the start of the fire and the first major reaction. The peak pressures from the reactions that were recorded are shown in Table 4-7. A true zero-time for each event was not available. Zero time for all events except the events listed below were referenced to 35 ms before gauge P6. Zero time for events 47, 55, and 60 were referenced to 65 ms before gauge P6. Zero time for event 3 was referenced to 60 ms before gauge P7. Zero time for event 10 was referenced to 35 ms before gauge P2. The pressure data for the two 50-foot range gauges (P1 and P5) during the first half of the reactions appear anomalous. This may be due to the gauges close proximity to the fire--thus heating the gauges beyond their operating temperature range. Since no zero time was available, shock arrival time at each position and, hence, event location, could not be determined. The pressure instrumentation indicated more reactions than there were missing projectiles--this discrepancy can be attributed to propellant-type reactions which were mistaken for projectile reactions. If a true zero time had been available, allowing the location of each event to be determined, then these propellant reactions could have been identified (see test 6).

### TEST 5

The fifth test again consisted of eight pallets of projectiles and was conducted on 29 April 1992. Following the test, 174 projectile bodies were recovered intact--indicating that 66 projectiles had reacted. Based on the on-site observations and the pressure instrumentation, 69 events or major reactions occurred. Table 4-8 presents the times of each of these events--relative to both the start of the fire and the first major reaction. The peak pressures from the reactions that were recorded are shown in Table 4-9. A true zero-time for each event was not available. Zero time for all events except the events listed below were referenced to 35 ms before gauge P6. Zero time

for events 33, 50, 51, and 52 were referenced to 65 ms before gauge P2. There was no signal received from gauge P7. Since no zero time was available, shock arrival time at each position and, hence, event location, could not be determined. The pressure instrumentation indicated more reactions than there were missing projectiles--this discrepancy can be attributed to propellant-type reactions which were mistaken for projectile reactions. If a true zero time had been available, allowing the location of each event to be determined, then these propellant reactions could have been identified (see test 6).

## TEST 6

The sixth test consisted of 27 pallets with each pallet containing 32 projectiles for a total of 864 projectiles. This test was conducted on 28 October 1992. Following the test, 546 projectile bodies were recovered intact--indicating that 318 projectiles had reacted. Based on the on-site observations and the preliminary pressure instrumentation, 324 events or major reactions occurred. Table 4-10 presents the times of each of these events--relative to both the start of the fire and the first major reaction. The peak pressures from the reactions that were recorded are shown in Table 4-11. A zero-time sensor was available for this event, therefore, shock time of arrival can also be determined. This is presented in Table 4-12.

The gauge at location P1 gave inconsistent results and was not included in the pressure tabulation. There are several event numbers for which no event time was measured. This could be due to any of several causes. Two of the most likely, however, include: (1) the fiber optic zero time sensor becoming saturated from an event which occurred momentarily before the next reaction and (2) some reactions may have been shielded from the zero time sensor if the reaction occurred on the opposite side of the stack from which the sensor was located.

The difference between the number of events presented in Table 4-10 and the number of unrecovered projectiles can be attributed to propellant reactions. These reactions will be separated out and discussed in the following chapter.

Figure 4-1 presents a sample of the pressure-time waveforms which were recorded on this test. It presents the data recorded on one of the 324 events. Also presented is the shape of the zero time pulse which was recorded for this event.

According to Table 4-10, the first event occurred approximately 26 minutes after the start of the fire. The zero time for the thermocouple analysis was adjusted to the time for event 1. Any thermocouple readings taken beyond a time of approximately 25 minutes would, therefore, be suspect. The maximum temperatures which are reported in Table 4-13 are those which occur in the first 24 minutes of the fire.

Figure 4-2 presents the temperature-time waveforms which were recorded during the first 25 (or so) minutes of the fire. Figure 3-4 gives the location of each thermocouple in some detail.

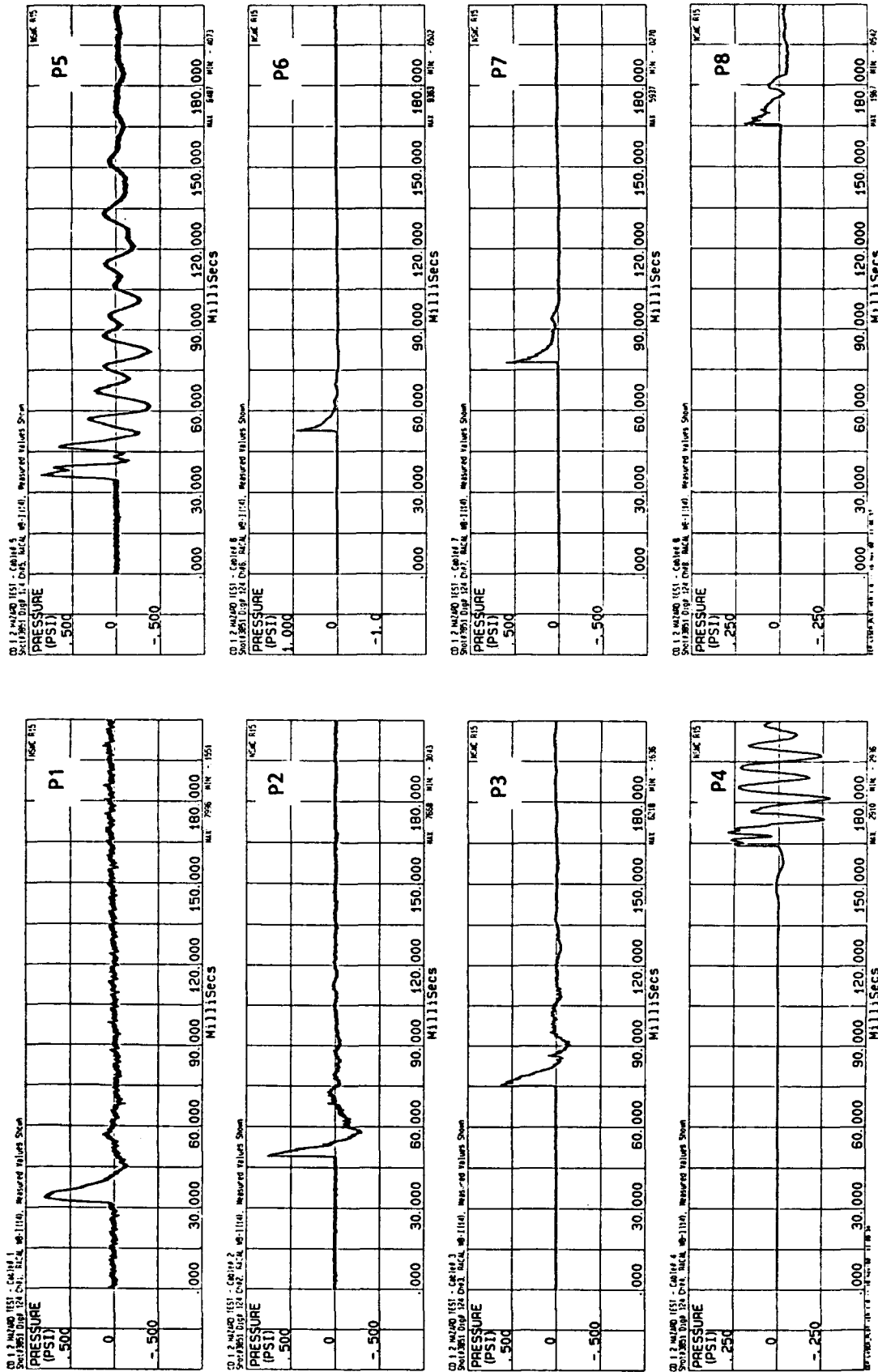


FIGURE 4-1. SAMPLE PRESSURE-TIME WAVEFORMS

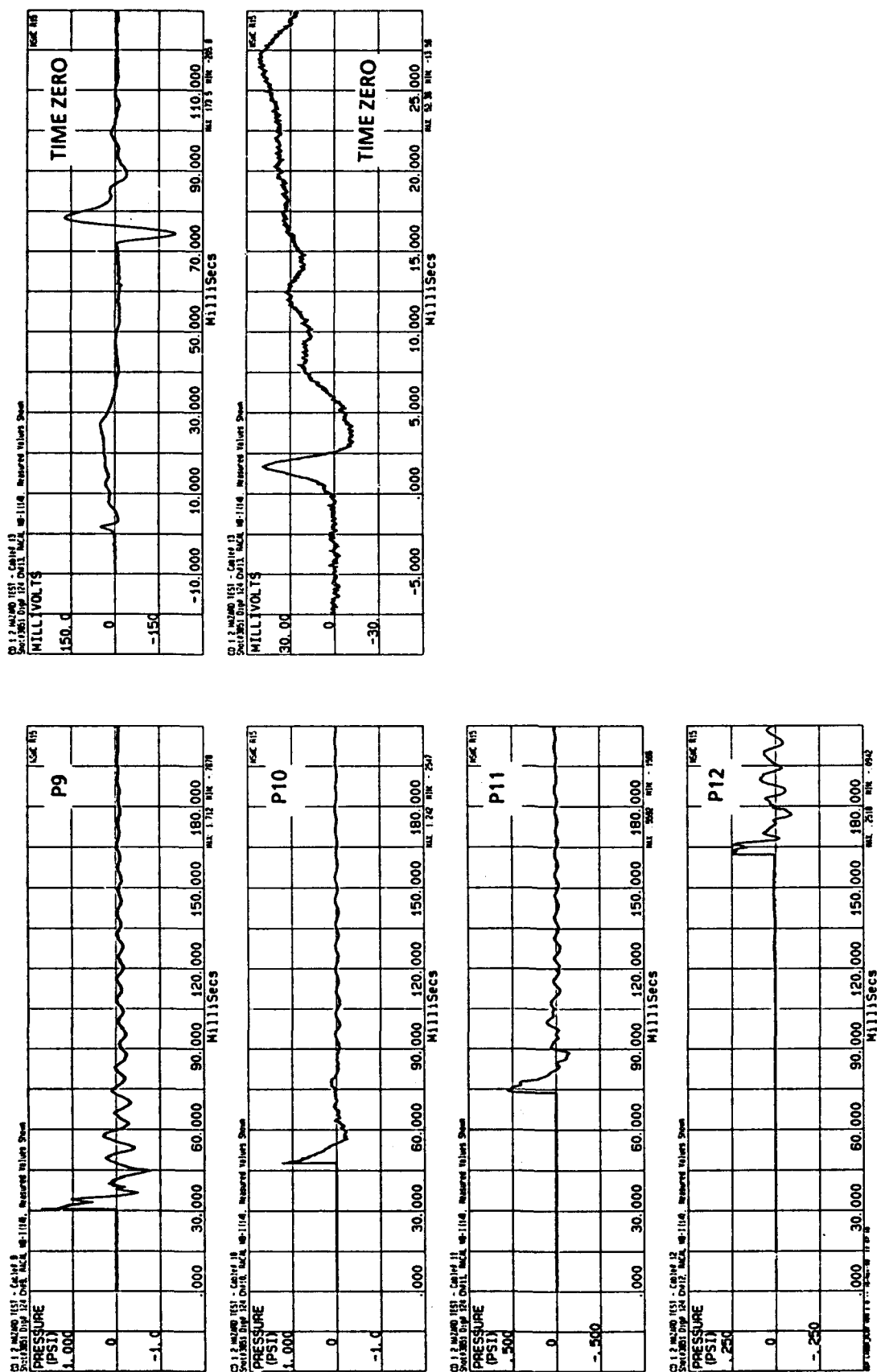


**FIGURE 4-1. SAMPLE PRESSURE-TIME WAVEFORMS (Continued)**

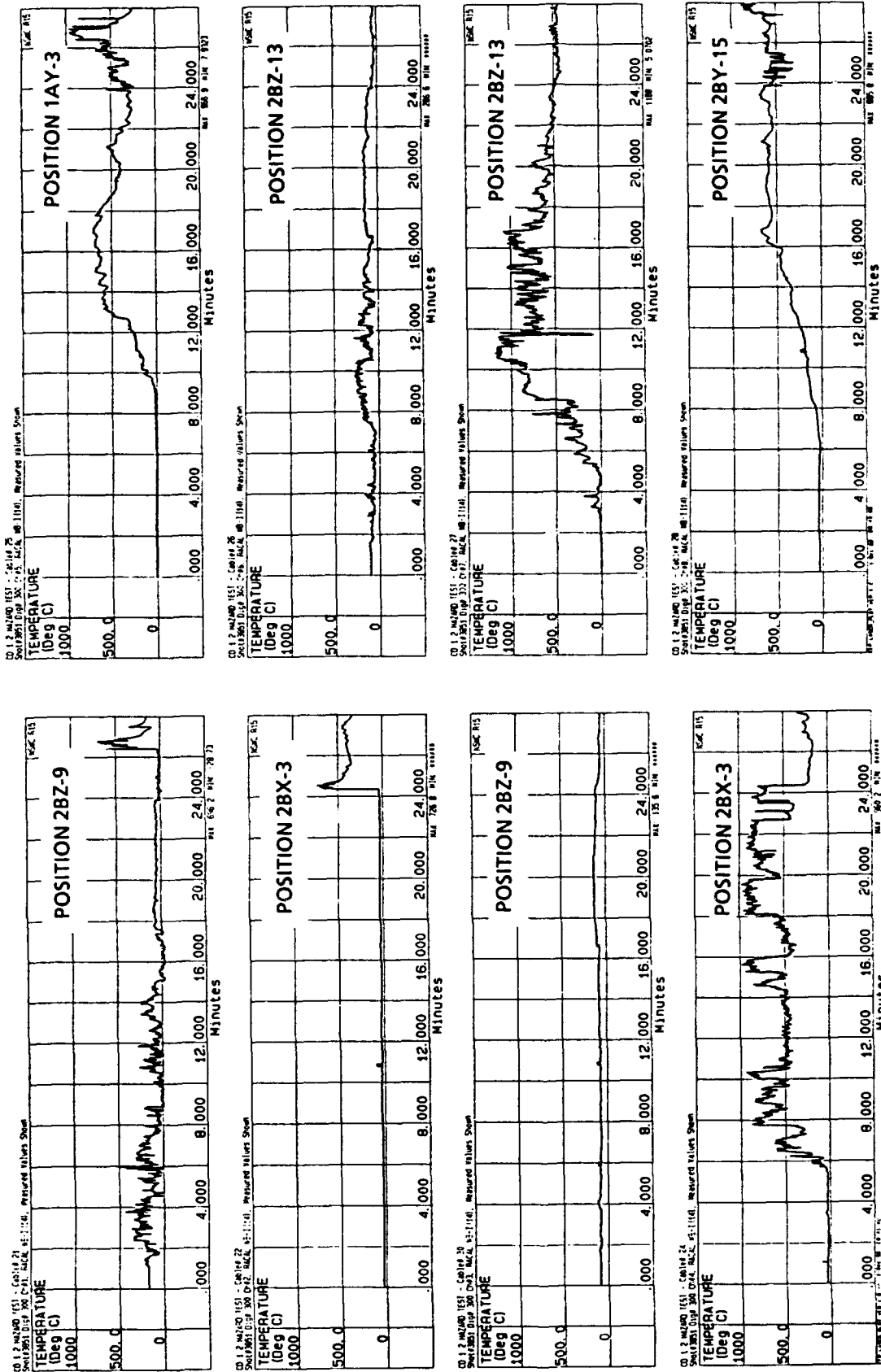


FIGURE 4-2. TEMPERATURE-TIME WAVEFORMS

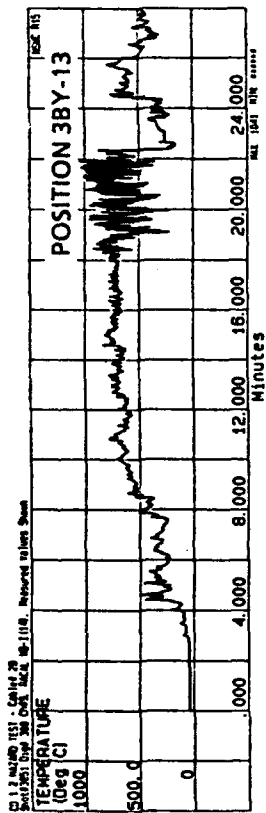


FIGURE 4-2. TEMPERATURE-TIME WAVEFORMS (Continued)

TABLE 4-1. TEST 1 EVENT TIMES

| EVENT<br>NUMBER | TIME CODE<br>(h:m:s) | VIDEO<br>EVENT TIME*<br>(h:m:s) | ELAPSED TIME<br>TIME CODE**<br>(h:m:s) | ELAPSED TIME<br>VIDEO.**<br>(h:m:s) |
|-----------------|----------------------|---------------------------------|----------------------------------------|-------------------------------------|
| 1               | NO INSTRUMENTATION   | 0:18:24                         | NO INSTRUMENTATION                     |                                     |
| 2               | NO INSTRUMENTATION   | 0:18:51                         | NO INSTRUMENTATION                     | 0:00:27                             |
| 3               | NO INSTRUMENTATION   | 0:19:58                         | NO INSTRUMENTATION                     | 0:01:34                             |
| 4               | NO INSTRUMENTATION   | 0:20:43                         | NO INSTRUMENTATION                     | 0:02:19                             |
| 5               | NO INSTRUMENTATION   | 0:20:55                         | NO INSTRUMENTATION                     | 0:02:31                             |
| 6               | NO INSTRUMENTATION   | 0:27:40                         | NO INSTRUMENTATION                     | 0:09:16                             |
| 7               | NO INSTRUMENTATION   | 0:27:44                         | NO INSTRUMENTATION                     | 0:09:20                             |
| 8               | NO INSTRUMENTATION   | 0:28:50                         | NO INSTRUMENTATION                     | 0:10:26                             |
| 9               | NO INSTRUMENTATION   | 0:29:34                         | NO INSTRUMENTATION                     | 0:11:10                             |
| 10              | NO INSTRUMENTATION   | 0:29:51                         | NO INSTRUMENTATION                     | 0:11:27                             |
| 11              | NO INSTRUMENTATION   | 0:33:48                         | NO INSTRUMENTATION                     | 0:15:24                             |
| 12              | NO INSTRUMENTATION   | 0:35:21                         | NO INSTRUMENTATION                     | 0:16:57                             |
| 13              | NO INSTRUMENTATION   | 0:48:53                         | NO INSTRUMENTATION                     | 0:30:29                             |

\*referenced to start of fire--data taken from video post-test

\*\*measured from first event

TABLE 4-2. TEST 2 EVENT TIMES

| EVENT<br>NUMBER | TIME CODE<br>(h:m:s) | W.D.H.<br>EVENT TIME*<br>(h:m:s) | ELAPSED TIME<br>TIME CODE**<br>(h:m:s) | ELAPSED TIME<br>W. D. H.**<br>(h:m:s) |
|-----------------|----------------------|----------------------------------|----------------------------------------|---------------------------------------|
| 1               | 10:15:43             | 0:24:14                          |                                        |                                       |
| 2               | 10:18:30             | 0:27:00                          | 0:02:47                                | 0:02:46                               |
| 3               | 10:22:26             | 0:31:55                          | 0:06:43                                | 0:07:41                               |
| 4               | 10:24:54             | 0:33:24                          | 0:09:11                                | 0:09:10                               |
| 5               | 10:25:02             | 0:33:31                          | 0:09:19                                | 0:09:17                               |
| 6               | 10:29:53             | 0:38:23                          | 0:14:10                                | 0:14:09                               |
| 7               | 10:30:38             | 0:39:08                          | 0:14:55                                | 0:14:54                               |
| 8               | 10:32:32             | 0:41:03                          | 0:16:49                                | 0:16:49                               |
| 9               | 10:34:05             | 0:42:35                          | 0:18:22                                | 0:18:21                               |

\*referenced to start of fire--W.D.H. is an onsite observer

\*\*measured from first event

TABLE 4-3. TEST 2 PRESSURE DATA

| EVENT<br>NUMBER | PEAK PRESSURE (psi) |               |               |                |                 |                 |               |                  |
|-----------------|---------------------|---------------|---------------|----------------|-----------------|-----------------|---------------|------------------|
|                 | POSITION NUMBER     |               |               |                |                 |                 |               |                  |
|                 | P1<br>(49 ft)       | P2<br>(69 ft) | P3<br>(99 ft) | P4<br>(199 ft) | P5<br>(48.8 ft) | P6<br>(68.8 ft) | P7<br>(99 ft) | P8<br>(198.8 ft) |
| 1               | NR                  | 0.19          | 0.12          | 0.04           | NR              | 0.34            | 0.22          | NR               |
| 2               | NR                  | 0.22          | 0.14          | 0.07           | NR              | 0.35            | 0.21          | 0.05             |
| 3               | NR                  | 0.24          | 0.17          | 0.08           | NR              | 0.72            | 0.41          | 0.16             |
| 4               | NR                  | 0.60          | 0.21          | 0.05           | NR              | 0.83            | 0.50          | 0.22             |
| 5               | NR                  | 0.11          | NR            | 0.03           | NR              | 0.46            | 0.24          | 0.10             |
| 6               | NR                  | 0.27          | 0.17          | 0.07           | NR              | 0.48            | 0.30          | 0.11             |
| 7               | NR                  | 0.53          | 0.39          | NR             | NR              | 1.25            | 0.66          | 0.26             |
| 8               | NR                  | 0.52          | NR            | 0.12           | NR              | 0.63            | 0.37          | NR               |
| 9               | NR                  | 0.73          | 0.33          | 0.15           | NR              | 0.90            | 0.50          | 0.17             |

NR: No Record

TABLE 4-4. TEST 3 EVENT TIMES

| EVENT<br>NUMBER | TIME CODE<br>(h:m:s) | W.D.H.<br>EVENT TIME*<br>(h:m:s) | ELAPSED TIME<br>TIME CODE**<br>(h:m:s) | ELAPSED TIME<br>W. D. H.**<br>(h:m:s) |
|-----------------|----------------------|----------------------------------|----------------------------------------|---------------------------------------|
| 1               | 11:44:16             | 0:36:48                          |                                        |                                       |
| 2               | 11:54:33             | 0:47:06                          | 0:10:17                                | 0:10:18                               |
| 3               | 11:56:30             | 0:49:03                          | 0:12:14                                | 0:12:15                               |
| 4               | 11:58:38             | 0:51:11                          | 0:14:22                                | 0:14:23                               |
| 5               | 12:02:18             | 0:54:51                          | 0:18:02                                | 0:18:03                               |
| 6               | 12:03:57             | 0:56:31                          | 0:19:41                                | 0:19:43                               |
| 7               | 12:04:37             | 0:57:10                          | 0:20:21                                | 0:20:22                               |
| 8               | 12:08:57             | 1:01:32                          | 0:24:41                                | 0:24:44                               |
| 9               | 12:10:41             | 1:03:14                          | 0:26:25                                | 0:26:26                               |
| 10              | ***                  | 1:07:35                          | ***                                    | 0:30:47                               |
| 11              | ***                  | 1:18:40                          | ***                                    | 0:41:52                               |

\*referenced to start of fire--W.D.H. is an onsite observer

\*\*measured from first event

\*\*\*events occurred after tape recorder stopped

TABLE 4-5. TEST 3 PRESSURE DATA

| EVENT<br>NUMBER | PEAK PRESSURE (psi) |               |               |                |                 |                 |               |                  |
|-----------------|---------------------|---------------|---------------|----------------|-----------------|-----------------|---------------|------------------|
|                 | POSITION NUMBER     |               |               |                |                 |                 |               |                  |
|                 | P1<br>(49 ft)       | P2<br>(69 ft) | P3<br>(99 ft) | P4<br>(199 ft) | P5<br>(48.8 ft) | P6<br>(68.8 ft) | P7<br>(99 ft) | P8<br>(198.8 ft) |
| 1               | 0.44                | 0.28          | 0.16          | 0.08           | 0.33            | 0.22            | 0.15          | 0.07             |
| 2               | 1.01                | 0.62          | 0.30          | 0.14           | 0.89            | 0.48            | 0.28          | 0.13             |
| 3               | 0.82                | 0.58          | 0.27          | 0.11           | 1.23            | 0.71            | 0.42          | 0.17             |
| 4               | 1.25                | 0.79          | 0.46          | 0.17           | 1.23            | 0.65            | 0.43          | 0.18             |
| 5               | 2.55                | 1.67          | 0.86          | 0.37           | 2.15            | 1.21            | 0.67          | 0.25             |
| 6               | 0.89                | 0.58          | 0.42          | 0.17           | 1.42            | 0.85            | 0.53          | 0.20             |
| 7               | 1.55                | 1.11          | 0.56          | 0.24           | 3.18            | 1.50            | 0.71          | 0.22             |
| 8               | 1.16                | 0.76          | 0.43          | 0.17           | 1.12            | 0.62            | 0.35          | 0.16             |
| 9               | 0.62                | 0.65          | 0.38          | 0.18           | 0.32            | 0.27            | 0.18          | 0.09             |
| 10*             |                     |               |               |                |                 |                 |               |                  |
| 11*             |                     |               |               |                |                 |                 |               |                  |

\*events occurred after tape recorder stopped

TABLE 4-6. TEST 4 EVENT TIMES

| EVENT<br>NUMBER | Time Code<br>(h:m:s) | W. D. H<br>EVENT TIME*<br>(h:m:s) | Elapsed time<br>TIME CODE**<br>(h:m:s) | Elapsed time<br>W. D. H. **<br>(h:m:s) |
|-----------------|----------------------|-----------------------------------|----------------------------------------|----------------------------------------|
| 1               | 13:06:45             | 0:20:48                           |                                        |                                        |
| 2               | 13:09:44             | 0:23:48                           | 0:02:59                                | 0:03:00                                |
| 3               | 13:09:54             | 0:23:59                           | 0:03:09                                | 0:03:11                                |
| 4               | 13:11:48             | 0:25:51                           | 0:05:03                                | 0:05:03                                |
| 5               | 13:12:29             | 0:26:32                           | 0:05:44                                | 0:05:44                                |
| 6               | 13:12:34             | 0:26:37                           | 0:05:49                                | 0:05:49                                |
| 7               | 13:13:10             | 0:27:13                           | 0:06:25                                | 0:06:25                                |
| 8               | 13:13:33             | 0:27:36                           | 0:06:48                                | 0:06:48                                |
| 9               | 13:13:41             | 0:27:44                           | 0:06:56                                | 0:06:56                                |
| 10              | 13:13:55             | 0:27:45                           | 0:07:10                                | 0:06:57                                |
| 11              | 13:14:19             | 0:28:21                           | 0:07:34                                | 0:07:33                                |
| 12              | 13:14:26             | 0:28:30                           | 0:07:41                                | 0:07:42                                |
| 13              | 13:15:20             | 0:29:23                           | 0:08:35                                | 0:08:35                                |
| 14              | 13:15:20.15          |                                   | 0:08:35.15                             |                                        |
| 15              | 13:15:55             | 0:29:58                           | 0:09:10                                | 0:09:10                                |
| 16              | 13:16:56             | 0:30:59                           | 0:10:11                                | 0:10:11                                |
| 17              | 13:17:01             | 0:31:04                           | 0:10:16                                | 0:10:16                                |
| 18              | 13:17:13             | 0:31:14                           | 0:10:28                                | 0:10:26                                |
| 19              | 13:17:19             | 0:31:21                           | 0:10:34                                | 0:10:33                                |
| 20              | 13:17:20.48          |                                   | 0:10:35.48                             |                                        |
| 21              | 13:17:20.49          |                                   | 0:10:35.49                             |                                        |
| 22              | 13:17:45             | 0:31:47                           | 0:11:00                                | 0:10:59                                |
| 23              | 13:17:51             | 0:31:54                           | 0:11:06                                | 0:11:06                                |
| 24              | 13:18:14             | 0:32:16                           | 0:11:29                                | 0:11:28                                |
| 25              | 13:18:21             | 0:32:24                           | 0:11:36                                | 0:11:36                                |
| 26              | 13:19:09             | 0:33:12                           | 0:12:24                                | 0:12:24                                |
| 27              | 13:19:13             | 0:33:16                           | 0:12:28                                | 0:12:28                                |
| 28              | 13:19:46             | 0:33:49                           | 0:13:01                                | 0:13:01                                |
| 29              | 13:20:04             | 0:34:07                           | 0:13:19                                | 0:13:19                                |
| 30              | 13:20:07             | 0:34:10                           | 0:13:22                                | 0:13:22                                |
| 31              | 13:20:09             | 0:34:12                           | 0:13:24                                | 0:13:24                                |
| 32              | 13:20:41             | 0:34:44                           | 0:13:56                                | 0:13:56                                |
| 33              | 13:20:46             | 0:34:49                           | 0:14:01                                | 0:14:01                                |
| 34              | 13:21:01             | 0:35:04                           | 0:14:16                                | 0:14:16                                |
| 35              | 13:21:24             | 0:35:27                           | 0:14:39                                | 0:14:39                                |
| 36              | 13:21:25             | 0:35:28                           | 0:14:40                                | 0:14:40                                |
| 37              | 13:21:44             | 0:35:46                           | 0:14:59                                | 0:14:58                                |
| 38              | 13:22:08             | 0:36:11                           | 0:15:23                                | 0:15:23                                |
| 39              | 13:22:27             | 0:36:30                           | 0:15:42                                | 0:15:42                                |
| 40              | 13:22:39             | 0:36:42                           | 0:15:54                                | 0:15:54                                |
| 41              | 13:23:02             | 0:37:05                           | 0:16:17                                | 0:16:17                                |
| 42              | 13:23:12             | 0:37:15                           | 0:16:27                                | 0:16:27                                |
| 43              | 13:23:44             | 0:37:46                           | 0:16:59                                | 0:16:58                                |

TABLE 4-6. TEST 4 EVENT TIMES (Continued)

| EVENT<br>NUMBER | Time Code<br>(h:m:s) | W. D. H<br>EVENT TIME*<br>(h:m:s) | Elapsed time<br>TIME CODE**<br>(h:m:s) | Elapsed time<br>W. D. H. **<br>(h:m:s) |
|-----------------|----------------------|-----------------------------------|----------------------------------------|----------------------------------------|
| 44              | 13:24:35             | 0:38:39                           | 0:17:50                                | 0:17:51                                |
| 45              | 13:25:58             | 0:40:00                           | 0:19:13                                | 0:19:12                                |
| 46              | 13:26:04             | 0:40:05                           | 0:19:19                                | 0:19:17                                |
| 47              | 13:26:12             | 0:40:24                           | 0:19:27                                | 0:19:36                                |
| 48              | 13:26:19             | 0:40:29                           | 0:19:34                                | 0:19:41                                |
| 49              | 13:26:21.50          | 0:40:30                           | 0:19:36.50                             | 0:19:42                                |
| 50              | 13:26:21.68          | 0:40:31                           | 0:19:36.68                             | 0:19:43                                |
| 51              | 13:26:26             | 0:40:33                           | 0:19:41                                | 0:19:45                                |
| 52              | 13:27:15.15          | 0:41:18                           | 0:20:30.15                             | 0:20:30                                |
| 53              | 13:27:15.50          | 0:41:19                           | 0:20:30.50                             | 0:20:31                                |
| 54              | 13:27:57             | 0:42:00                           | 0:21:12                                | 0:21:12                                |
| 55              | 13:28:13             | 0:42:15                           | 0:21:28                                | 0:21:27                                |
| 56              | 13:28:16             | 0:42:23                           | 0:21:31                                | 0:21:35                                |
| 57              | 13:28:20             | 0:42:25                           | 0:21:35                                | 0:21:37                                |
| 58              | 13:28:47             | 0:42:50                           | 0:22:02                                | 0:22:02                                |
| 59              | 13:29:10             | 0:43:13                           | 0:22:25                                | 0:22:25                                |
| 60              | 13:29:41             | 0:43:44                           | 0:22:56                                | 0:22:56                                |
| 61              | 13:30:10             | 0:44:13                           | 0:23:25                                | 0:23:25                                |
| 62              | 13:30:36             | 0:44:38                           | 0:23:51                                | 0:23:50                                |
| 63              | 13:32:22             | 0:46:25                           | 0:25:37                                | 0:25:37                                |
| 64              | 13:33:02             | 0:47:04                           | 0:26:17                                | 0:26:16                                |
| 65              | 13:33:43             | 0:47:46                           | 0:26:58                                | 0:26:58                                |
| 66              | 13:37:38             | 0:51:40                           | 0:30:53                                | 0:30:52                                |
| 67              | 13:38:55             | 0:52:58                           | 0:32:10                                | 0:32:10                                |
| 68              | 13:47:05             | 1:01:01                           | 0:40:20                                | 0:40:13                                |

\*referenced to start of fire--W.D.H. is an onsite observer

\*\*measured from first event

TABLE 4-7. TEST 4 PRESSURE DATA

| EVENT<br>NUMBER | PEAK PRESSURE (psi) |               |               |                  |                 |                 |               |                  |
|-----------------|---------------------|---------------|---------------|------------------|-----------------|-----------------|---------------|------------------|
|                 | POSITION NUMBER     |               |               |                  |                 |                 |               |                  |
|                 | P1<br>(49 ft)       | P2<br>(69 ft) | P3<br>(99 ft) | P4<br>(199.5 ft) | P5<br>(48.8 ft) | P6<br>(68.8 ft) | P7<br>(99 ft) | P8<br>(198.8 ft) |
| 1               | 1.05                | 0.64          | 0.42          | 0.15             | NR              | 0.88            | 0.58          | 0.19             |
| 2               | NR                  | 0.24          | 0.15          | 0.04             | 0.21            | 0.15            | 0.08          | 0.03             |
| 3               | NR                  | 0.30          | 0.19          | 0.08             | NR              |                 | 0.10          | 0.04             |
| 4               | NR                  | 0.34          | 0.23          | 0.09             | 0.16?           | 0.21            | 0.16          | 0.07             |
| 5               | NR                  | 0.76          | 0.40          | 0.11             | NR              | 0.52            | 0.33          | 0.14             |
| 6               | NR                  | 0.66          | 0.38          | 0.11             | 0.44            | 0.41            | 0.27          | 0.12             |
| 7               | NR                  | 0.34          | 0.19          | 0.07             | NR              | 0.24            | 0.18          | 0.07             |
| 8               | NR                  | 0.48          | 0.33          | 0.05             | NR              | 0.33            | 0.23          | 0.09             |
| 9               | NR                  | 0.73          | 0.55          | 0.09             | NR              | 0.38            | 0.21          | 0.11             |
| 10              | NR                  | 0.13          | 0.05          | 0.01             | NR              | NR              | NR            | NR               |
| 11              | NR                  | 0.66          | 0.44          | 0.07             | NR              | 1.21            | 0.76          | 0.22             |
| 12              | NR                  | NR            | 0.19          | 0.03             | NR              | 0.25            | 0.18          | 0.06             |
| 13              | NR                  | NR            | 0.42          | 0.12             | NR              | 1.13            | 0.82          | 0.28             |
| 14              | NR                  | NR            | 0.26          | 0.09             | NR              | 1.04            | 0.68          | 0.24             |
| 15              | NR                  | 0.51          | 0.29          | 0.10             | 0.32            | 0.23            | 0.17          | 0.07             |
| 16              | NR                  | 0.41          | 0.25          | 0.10             | NR              | 0.51            | 0.38          | 0.16             |
| 17              | NR                  | 0.32          | 0.21          | 0.09             | NR              | 0.95            | 0.69          | 0.25             |
| 18              | NR                  | 0.84          | 0.47          | 0.19             | NR              | 0.79            | 0.58          | 0.20             |
| 19              | NR                  | 0.76          | 0.44          | 0.19             | NR              | 0.49            | 0.35          | 0.18             |
| 20              | NR                  | 0.48          | 0.41          | 0.24             | NR              | 0.49            | 0.35          | 0.18             |
| 21              | NR                  | 0.65          | 0.37          | 0.18             | NR              | 0.36            | 0.23          | 0.09             |
| 22              | NR                  | 0.71          | 0.38          | 0.14             | NR              | 0.65            | 0.48          | 0.17             |
| 23              | NR                  | 0.59          | 0.35          | 0.15             | NR              | 0.60            | 0.37          | 0.15             |
| 24              | NR                  | 0.54          | 0.38          | 0.19             | NR              | 0.81            | 0.55          | 0.19             |
| 25              | NR                  | 0.64          | 0.46          | 0.22             | NR              | 0.53            | 0.40          | 0.17             |
| 26              | 0.75                | 0.16          | 0.13          | 0.07             | NR              | 0.27            | 0.24          | 0.11             |
| 27              | NR                  | 1.25          | 0.75          | 0.36             | NR              | 1.42            | 1.08          | 0.47             |
| 28              | NR                  | 0.28          | 0.19          | 0.10             | NR              | 0.48            | 0.35          | 0.14             |
| 29              | NR                  | 0.61          | 0.38          | 0.19             | NR              | 0.55            | 0.43          | 0.14             |
| 30              | NR                  | 0.76          | 0.45          | 0.19             | NR              | 0.61            | 0.41          | 0.16             |
| 31              | NR                  | 0.18          | 0.12          | 0.08             | NR              | 0.53            | 0.36          | 0.14             |
| 32              | 1.43                | 0.79          | 0.45          | 0.21             | NR              | 0.92            | 0.57          | 0.24             |
| 33              | NR                  | 0.42          | 0.29          | 0.14             | 0.38            | 0.25            | 0.17          | 0.08             |
| 34              | 1.15                | 0.73          | 0.48          | 0.21             | NR              | 0.60            | 0.40          | 0.17             |
| 35              | 1.13                | 0.66          | 0.42          | 0.18             | NR              | 0.59            | 0.42          | 0.18             |
| 36              | 1.07                | 0.60          | 0.37          | 0.18             | NR              | 0.66            | 0.39          | 0.17             |
| 37              | 0.72                | 0.44          | 0.30          | 0.12             | NR              | 0.60            | 0.41          | 0.14             |
| 38              | 0.70                | 0.39          | 0.28          | 0.12             | NR              | 0.42            | 0.31          | 0.12             |
| 39              | 1.59                | 0.95          | 0.56          | 0.24             | NR              | 0.70            | 0.47          | 0.18             |
| 40              | 0.64                | 0.44          | 0.29          | 0.15             | 0.69            | 0.57            | 0.44          | 0.17             |
| 41              | 0.87                | 0.58          | 0.37          | 0.16             | 0.64            | 0.56            | 0.44          | 0.17             |
| 42              | 1.74                | 1.01          | 0.55          | 0.21             | NR              | 1.31            | 0.63          | 0.29             |
| 43              | 1.22                | 0.62          | 0.37          | 0.17             | NR              | 1.02            | 0.72          | 0.25             |
| 44              | 1.51                | 0.83          | 0.47          | 0.20             | 0.72            | 0.59            | 0.43          | 0.17             |
| 45              | 1.27                | 0.76          | 0.51          | 0.18             | 1.00            | 0.71            | 0.53          | 0.21             |
| 46              | 0.14                | 0.10          | 0.06          | 0.03             | 0.26            | 0.18            | 0.15          | 0.06             |

TABLE 4-7. TEST 4 PRESSURE DATA (Continued)

| EVENT<br>NUMBER | PEAK PRESSURE (psi) |               |               |                  |                 |                 |               |                  |
|-----------------|---------------------|---------------|---------------|------------------|-----------------|-----------------|---------------|------------------|
|                 | POSITION NUMBER     |               |               |                  |                 |                 |               |                  |
|                 | P1<br>(49 ft)       | P2<br>(69 ft) | P3<br>(99 ft) | P4<br>(199.5 ft) | P5<br>(48.8 ft) | P6<br>(68.8 ft) | P7<br>(99 ft) | P8<br>(198.8 ft) |
| 47              | 2.38                | 1.17          | 0.68          | 0.23             | 0.65            | 0.43            | 0.31          | 0.16             |
| 48              | 1.77                | 0.98          | 0.54          | 0.19             | 0.98            | 0.71            | 0.47          | 0.18             |
| 49              | 0.68                | 0.40          | 0.26          | 0.14             | 1.22            | 0.97            | 0.65          | 0.29             |
| 50              | 1.37                | 0.81          | 0.41          | 0.19             | 0.60            | 0.48            | 0.37          | 0.16             |
| 51              | 1.40                | 0.80          | 0.48          | 0.21             | 0.76            | 0.50            | 0.35          | 0.15             |
| 52              | 2.29                | 1.13          | 0.60          | 0.23             | 0.82            | 0.60            | 0.41          | 0.17             |
| 53              | 0.60                | 0.46          | 0.31          | 0.16             | 0.677           | 0.82            | 0.66          | 0.19             |
| 54              | 2.19                | 1.61          | 0.53          | 0.22             | .847            | 1.04            | 0.57          | 0.21             |
| 55              | 1.75                | 0.75          | 0.37          | 0.15             | 0.63            | 0.47            | 0.38          | 0.16             |
| 56              | 1.29                | 0.66          | 0.41          | 0.15             | NR              | 1.03            | 0.63          | 0.21             |
| 57              | 1.35                | 0.81          | 0.42          | 0.20             | NR              | 0.97            | 0.62          | 0.19             |
| 58              | 2.80                | 1.30          | 0.68          | 0.28             | NR              | 0.90            | 0.57          | 0.20             |
| 59              | 1.19                | 0.58          | 0.39          | 0.19             | 0.92            | 0.65            | 0.40          | 0.13             |
| 60              | 0.51                | 0.39          | 0.47          | 0.49             | 0.31            | 0.29            | 0.29          | 0.18             |
| 61              | 1.82                | 0.91          | 0.50          | 0.19             | .667            | 0.61            | 0.39          | 0.14             |
| 62              | NR                  | 0.67          | 0.44          | 0.17             | 1.12            | 0.77            | 0.57          | 0.21             |
| 63              | NR                  | 0.28          | 0.18          | 0.08             | NR              | 0.67            | 0.50          | 0.17             |
| 64              | NR                  | 0.56          | 0.37          | 0.17             | 0.90            | 0.55            | 0.39          | 0.14             |
| 65              | NR                  | 1.20          | 0.62          | 0.27             | 1.11            | 0.76            | 0.47          | 0.19             |
| 66              | 1.24                | 0.68          | 0.38          | 0.16             | 0.93            | 0.75            | 0.53          | 0.17             |
| 67              | 2.25                | 1.09          | 0.60          | 0.22             | 1.06            | 0.71            | 0.50          | 0.21             |

NR: no useable record

TABLE 4-8. TEST 5 EVENT TIMES

| Event # | Time Code<br>(h:m:s) | W. D. H<br>Event Time*<br>(h:m:s) | Elapsed time<br>Time Code**<br>(h:m:s) | Elapsed time<br>W. D. H. **<br>(h:m:s) |
|---------|----------------------|-----------------------------------|----------------------------------------|----------------------------------------|
| 1       | 10:41:28             | 0:18:37                           | 0:00:00                                | 0:00:00                                |
| 2       | 10:41:48             | 0:18:56                           | 0:00:20                                | 0:00:19                                |
| 3       | 10:42:45             | 0:19:53                           | 0:01:17                                | 0:01:16                                |
| 4       | 10:44:10             | 0:21:18                           | 0:02:42                                | 0:02:41                                |
| 5       | 10:44:17             | 0:21:25                           | 0:02:49                                | 0:02:48                                |
| 6       | 10:44:27             | 0:21:35                           | 0:02:59                                | 0:02:58                                |
| 7       | 10:44:35             | 0:21:43                           | 0:03:07                                | 0:03:06                                |
| 8       | 10:44:45             | 0:21:51                           | 0:03:17                                | 0:03:14                                |
| 9       | 10:44:46             | 0:21:53                           | 0:03:18                                | 0:03:16                                |
| 10      | 10:45:00             | 0:22:07                           | 0:03:32                                | 0:03:30                                |
| 11      | 10:45:02             | 0:22:12                           | 0:03:34                                | 0:03:35                                |
| 12      | 10:45:09             | 0:22:17                           | 0:03:41                                | 0:03:40                                |
| 13      | 10:45:50             | 0:22:57                           | 0:04:22                                | 0:04:20                                |
| 14      | 10:46:03             | 0:23:11                           | 0:04:35                                | 0:04:34                                |
| 15      | 10:46:27             | 0:23:34                           | 0:04:59                                | 0:04:57                                |
| 16      | 10:46:29             | 0:23:37                           | 0:05:01                                | 0:05:00                                |
| 17      | 10:46:31             | 0:23:40                           | 0:05:03                                | 0:05:03                                |
| 18      | 10:46:34             | 0:23:42                           | 0:05:06                                | 0:05:05                                |
| 19      | 10:46:48             | 0:23:56                           | 0:05:20                                | 0:05:19                                |
| 20      | 10:46:59             | 0:24:07                           | 0:05:31                                | 0:05:30                                |
| 21      | 10:47:02             | 0:24:09                           | 0:05:34                                | 0:05:32                                |
| 22      | 10:47:32             | 0:24:40                           | 0:06:04                                | 0:06:03                                |
| 23      | 10:47:35             | 0:24:44                           | 0:06:07                                | 0:06:07                                |
| 24      | 10:47:46.411         | 0:24:54                           | 0:06:18.411                            | 0:06:17                                |
| 25      | 10:47:46.417         |                                   | 0:06:18.417                            |                                        |
| 26      | 10:47:47             | 0:24:55                           | 0:06:19                                | 0:06:18                                |
| 27      | 10:47:56             | 0:25:04                           | 0:06:28                                | 0:06:27                                |
| 28      | 10:48:02             | 0:25:09                           | 0:06:34                                | 0:06:32                                |
| 29      | 10:48:07             | 0:25:15                           | 0:06:39                                | 0:06:38                                |
| 30      | 10:48:09             | 0:25:18                           | 0:06:41                                | 0:06:41                                |
| 31      | 10:48:20             | 0:25:28                           | 0:06:52                                | 0:06:51                                |
| 32      | 10:48:28             | 0:25:38                           | 0:07:00                                | 0:07:01                                |
| 33      | 10:48:29             |                                   | 0:07:01                                |                                        |
| 34      | 10:48:33             | 0:25:41                           | 0:07:05                                | 0:07:04                                |
| 35      | 10:48:37             | 0:25:45                           | 0:07:09                                | 0:07:08                                |
| 36      | 10:48:42.5           | 0:25:50                           | 0:07:14.5                              | 0:07:13                                |
| 37      | 10:48:42.7           | 0:25:51                           | 0:07:14.7                              | 0:07:14                                |
| 38      | 10:48:47             | 0:25:55                           | 0:07:19                                | 0:07:18                                |
| 39      | 10:48:58             | 0:26:06                           | 0:07:30                                | 0:07:29                                |
| 40      | 10:49:08             | 0:26:16                           | 0:07:40                                | 0:07:39                                |
| 41      | 10:49:18             | 0:26:26                           | 0:07:50                                | 0:07:49                                |
| 42      | 10:49:22             | 0:26:30                           | 0:07:54                                | 0:07:53                                |
| 43      | 10:49:25             | 0:26:33                           | 0:07:57                                | 0:07:56                                |
| 44      | 10:49:33             | 0:26:41                           | 0:08:05                                | 0:08:04                                |
| 45      | 10:49:57             | 0:27:05                           | 0:08:29                                | 0:08:28                                |

TABLE 4-8. TEST 5 EVENT TIMES (Continued)

| Event # | Time Code<br>(h:m:s) | W. D. H<br>Event Time*<br>(h:m:s) | Elapsed time<br>Time Code**<br>(h:m:s) | Elapsed time<br>W. D. H. **<br>(h:m:s) |
|---------|----------------------|-----------------------------------|----------------------------------------|----------------------------------------|
| 46      | 10:50:01             | 0:27:09                           | 0:08:33                                | 0:08:32                                |
| 47      | 10:50:21             | 0:27:29                           | 0:08:53                                | 0:08:52                                |
| 48      | 10:50:36             | 0:27:44                           | 0:09:08                                | 0:09:07                                |
| 49      | 10:50:46             | 0:27:54                           | 0:09:18                                | 0:09:17                                |
| 50      | 10:51:25             | 0:28:34                           | 0:09:57                                | 0:09:57                                |
| 51      | 10:52:04             | 0:29:12                           | 0:10:36                                | 0:10:35                                |
| 52      | 10:52:05             | 0:29:13                           | 0:10:37                                | 0:10:36                                |
| 53      | 10:52:41.184         | 0:29:49                           | 0:11:13.184                            | 0:11:12                                |
| 54      | 10:52:41.189         |                                   | 0:11:13.189                            |                                        |
| 55      | 10:52:41.950         | 0:29:50                           | 0:11:13.950                            | 0:11:13                                |
| 56      | 10:52:41.959         |                                   | 0:11:13.959                            |                                        |
| 57      | 10:52:46             | 0:29:55                           | 0:11:18                                | 0:11:18                                |
| 58      | 10:53:22             | 0:30:30                           | 0:11:54                                | 0:11:53                                |
| 59      | 10:53:37             | 0:30:45                           | 0:12:09                                | 0:12:08                                |
| 60      | 10:53:50             | 0:30:58                           | 0:12:22                                | 0:12:21                                |
| 61      | 10:53:54             | 0:31:04                           | 0:12:26                                | 0:12:27                                |
| 62      | 10:54:25             | 0:31:33                           | 0:12:57                                | 0:12:56                                |
| 63      | 10:55:21             | 0:32:29                           | 0:13:53                                | 0:13:52                                |
| 64      | 10:56:35             | 0:33:43                           | 0:15:07                                | 0:15:06                                |
| 65      | 10:59:40             | 0:36:48                           | 0:18:12                                | 0:18:11                                |
| 66      | 11:00:20             | 0:37:28                           | 0:18:52                                | 0:18:51                                |
| 67      | 11:01:37             | 0:38:46                           | 0:20:09                                | 0:20:09                                |
| 68      | 11:02:20             | 0:39:28                           | 0:20:52                                | 0:20:51                                |
| 69      | 11:04:34             | 0:41:42                           | 0:23:06                                | 0:23:05                                |

\*referenced to start of fire--W. D. H. is an onsite observer

\*\*measured from first event

TABLE 4-9. TEST 5 PRESSURE DATA

| EVENT<br>NUMBER | PEAK PRESSURE (psi) |               |                 |                  |                 |                 |               |                  |
|-----------------|---------------------|---------------|-----------------|------------------|-----------------|-----------------|---------------|------------------|
|                 | POSITION NUMBER     |               |                 |                  |                 |                 |               |                  |
|                 | P1<br>(49 ft)       | P2<br>(69 ft) | P3<br>(99.3 ft) | P4<br>(199.5 ft) | P5<br>(48.8 ft) | P6<br>(68.8 ft) | P7<br>(99 ft) | P8<br>(198.8 ft) |
| 1               | 0.52                | 0.37          | 0.19            | 0.10             | 1.19            | 0.69            | NR            | 0.21             |
| 2               | 0.22                | 0.32          | 0.19            | 0.10             | 0.29            | 0.18            | NR            | 0.05             |
| 3               | 0.47                | 0.44          | 0.23            | 0.10             | 0.43            | 0.31            | NR            | 0.08             |
| 4               | NR                  | 1.15          | 0.52            | 0.21             | 2.07            | 1.84            | NR            | 0.44             |
| 5               | NR                  | 0.35          | 0.18            | 0.09             | 0.50            | 0.30            | NR            | 0.08             |
| 6               | NR                  | 0.39          | 0.21            | 0.11             | 1.91            | 0.97            | NR            | 0.14             |
| 7               | NR                  | 0.43          | 0.26            | 0.12             | 2.11            | 1.47            | NR            | 0.22             |
| 8               | NR                  | 0.36          | 0.20            | 0.11             | 0.29            | 0.22            | NR            | 0.06             |
| 9               | NR                  | 0.58          | 0.27            | 0.10             | 1.15            | 0.96            | NR            | 0.16             |
| 10              | NR                  | 0.21          | 0.13            | 0.06             | 0.36            | 0.24            | NR            | 0.06             |
| 11              | NR                  | 0.31          | 0.23            | 0.08             | NR              | 0.38            | NR            | 0.11             |
| 12              | NR                  | 0.29          | 0.18            | 0.07             | 0.92            | 0.60            | NR            | 0.09             |
| 13              | NR                  | 0.45          | 0.19            | 0.12             | 2.21            | 0.96            | NR            | 0.36             |
| 14              | NR                  | 0.21          | 0.10            | 0.09             | 1.62            | 0.97            | NR            | 0.20             |
| 15              | NR                  | 0.34          | 0.18            | 0.06             | 0.45            | 0.31            | NR            | 0.08             |
| 16              | NR                  | 0.19          | 0.12            | 0.06             | 0.87            | 0.54            | NR            | 0.10             |
| 17              | NR                  | 0.31          | 0.15            | 0.10             | 0.75            | 0.49            | NR            | 0.10             |
| 18              | NR                  | 0.22          | 0.09            | 0.07             | 0.25            | 0.19            | NR            | 0.05             |
| 19              | NR                  | 0.43          | 0.22            | 0.11             | NR              | 1.57            | NR            | 0.28             |
| 20              | NR                  | 0.31          | 0.16            | 0.09             | 0.70            | 0.36            | NR            | 0.07             |
| 21              | NR                  | 0.30          | 0.19            | 0.09             | 0.60            | 0.44            | NR            | 0.17             |
| 22              | 1.16                | 0.63          | 0.28            | 0.13             | 0.75            | 0.46            | NR            | 0.13             |
| 23              | 0.46                | 0.32          | 0.22            | 0.09             | 1.00            | 0.61            | NR            | 0.10             |
| 24              | 0.45                | 0.31          | 0.15            | 0.11             | 2.41            | 1.36            | NR            | 0.21             |
| 25              | 0.45                | 0.31          | 0.18            | 0.11             | 2.40            | 1.51            | NR            | 0.19             |
| 26              | 1.31                | 0.68          | 0.37            | 0.15             | 1.31            | 0.74            | NR            | 0.16             |
| 27              | 1.06                | 0.55          | 0.29            | 0.12             | NR              | 0.47            | NR            | 0.14             |
| 28              | 0.83                | 0.47          | 0.21            | 0.11             | 0.86            | 0.70            | NR            | 0.16             |
| 29              | 0.60                | 0.42          | 0.17            | 0.11             | 0.45            | 0.39            | NR            | 0.10             |
| 30              | 1.26                | 1.05          | 0.62            | 0.24             | 0.37            | 0.43            | NR            | 0.12             |
| 31              | 0.72                | 1.12          | 0.45            | 0.16             | NR              | 0.33            | NR            | 0.13             |
| 32              | 0.23                | 0.26          | 0.14            | 0.10             | 1.52            | 0.95            | NR            | 0.24             |
| 33              | 0.61                | 0.43          | 0.22            | 0.12             | 0.22            | 0.15            | NR            | 0.04             |
| 34              | 0.53                | 0.34          | 0.17            | 0.11             | 0.57            | 0.39            | NR            | 0.10             |
| 35              | 0.85                | 0.44          | 0.25            | 0.10             | 0.97            | 0.81            | NR            | 0.19             |
| 36              | 0.40                | 0.25          | 0.10            | 0.10             | 0.47            | 0.37            | NR            | 0.12             |
| 37              | 1.86                | 0.89          | 0.46            | 0.18             | 0.49            | 0.46            | NR            | 0.15             |
| 38              | 0.75                | 0.36          | 0.18            | 0.09             | 0.20            | 0.16            | NR            | 0.05             |
| 39              | 1.29                | 0.71          | 0.37            | 0.14             | 0.64            | 0.36            | NR            | 0.10             |
| 40              | 0.38                | 0.26          | 0.15            | 0.11             | 0.88            | 0.82            | NR            | 0.13             |
| 41              | 0.58                | 0.36          | 0.20            | 0.13             | 0.42            | 0.59            | NR            | 0.12             |
| 42              | 0.92                | 0.57          | 0.36            | 0.15             | 0.22            | 0.15            | NR            | 0.05             |
| 43              | 0.50                | 0.33          | 0.22            | 0.10             | 0.64            | 0.46            | NR            | 0.09             |
| 44              | 0.98                | 0.69          | 0.41            | 0.17             | 3.91            | 1.97            | NR            | 0.26             |
| 45              | 0.57                | 0.36          | 0.26            | 0.10             | 0.20            | 0.19            | NR            | 0.05             |
| 46              | 1.32                | 0.67          | 0.33            | 0.18             | 0.34            | 0.38            | NR            | 0.13             |
| 47              | 0.59                | 0.37          | 0.25            | 0.12             | 0.19            | 0.21            | NR            | 0.06             |
| 48              | 0.76                | 0.45          | 0.22            | 0.14             | 0.79            | 0.35            | NR            | 0.12             |
| 49              | 1.27                | 0.66          | 0.31            | 0.18             | 0.34            | 0.30            | NR            | 0.07             |

TABLE 4-9. TEST 5 PRESSURE DATA (Continued)

| EVENT<br>NUMBER | PEAK PRESSURE (psi) |               |                 |                  |                 |                 |               |                  |
|-----------------|---------------------|---------------|-----------------|------------------|-----------------|-----------------|---------------|------------------|
|                 | POSITION NUMBER     |               |                 |                  |                 |                 |               |                  |
|                 | P1<br>(49 ft)       | P2<br>(69 ft) | P3<br>(99.3 ft) | P4<br>(199.5 ft) | P5<br>(48.8 ft) | P6<br>(68.8 ft) | P7<br>(99 ft) | P8<br>(198.8 ft) |
| 50              | 0.83                | 0.48          | 0.30            | 0.11             | 0.81            | NR              | NR            | 0.11             |
| 51              | 0.38                | 0.25          | 0.13            | 0.09             | 0.64            | NR              | NR            | 0.08             |
| 52              | 0.85                | 0.47          | 0.25            | 0.13             | 0.53            | NR              | NR            | 0.12             |
| 53              | 1.42                | 0.67          | 0.27            | 0.16             | 0.74            | 0.39            | NR            | 0.14             |
| 54              | 0.60                | 0.34          | 0.16            | 0.09             | NR              | NR              | NR            | 0.06             |
| 55              | 1.60                | 0.76          | 0.44            | 0.21             | 1.46            | 0.36            | NR            | 0.19             |
| 56              | NR                  | 0.53          | 0.33            | NR               | 0.88            | NR              | NR            | 0.13             |
| 57              | 2.13                | 1.16          | 0.52            | 0.25             | 2.89            | 1.04            | NR            | 0.31             |
| 58              | 1.26                | 0.59          | 0.29            | 0.14             | 1.44            | 0.33            | NR            | 0.14             |
| 59              | 0.64                | 0.35          | 0.16            | 0.09             | 0.95            | 0.48            | NR            | 0.14             |
| 60              | 0.23                | 0.16          | 0.08            | 0.07             | 0.60            | 0.51            | NR            | 0.13             |
| 61              | 0.56                | 0.31          | 0.20            | 0.10             | 0.30            | 0.26            | NR            | 0.08             |
| 62              | 0.75                | 0.40          | 0.24            | 0.11             | 0.76            | 0.57            | NR            | 0.12             |
| 63              | 0.78                | 0.54          | 0.30            | 0.13             | 0.49            | 0.42            | NR            | 0.13             |
| 64              | 1.00                | 0.63          | 0.38            | 0.16             | 1.28            | 0.81            | NR            | 0.18             |
| 65              | 0.93                | 0.50          | 0.29            | 0.13             | 1.92            | 1.03            | NR            | 0.19             |
| 66              | 1.26                | 0.77          | 0.46            | 0.17             | 1.66            | 0.92            | NR            | 0.21             |
| 67              | 0.74                | 0.50          | 0.34            | 0.14             | 1.67            | 1.08            | NR            | 0.26             |
| 68              | 1.33                | 0.76          | 0.38            | 0.20             | 2.26            | 1.13            | NR            | 0.22             |
| 69              | 1.11                | 0.56          | 0.26            | 0.14             | 1.29            | 0.73            | NR            | 0.16             |

NR: no useable record

TABLE 4-10. TEST 6 EVENT TIMES

| Event Number | Time Code<br>(h:m:s) | W. D. H<br>EVENT TIME*<br>(h:m:s) | Elapsed time:<br>TIME CODE**<br>(h:m:s) | Elapsed time:<br>W. D. H.**<br>(h:m:s) |
|--------------|----------------------|-----------------------------------|-----------------------------------------|----------------------------------------|
| 1            | 10:52:45.6           | 00:25:54                          | 0:00:00.0                               | 0:00:00.0                              |
| 2            | 10:53:18.6           | 0:26:24                           | 0:00:33.0                               | 0:00:30.30                             |
| 3            | 10:53:35.435         | 0:26:40                           | 0:00:49.835                             | 0:00:46.46                             |
| 4            | 10:53:35.443         |                                   | 0:00:49.843                             |                                        |
| 5            | 10:53:52.2           | 0:26:57                           | 0:01:06.6                               | 0:01:03.3                              |
| 6            | 10:55:58.7           | 0:29:04                           | 0:03:13.1                               | 0:03:10.10                             |
| 7            | 10:56:00.7           | 0:29:10                           | 0:03:15.1                               | 0:03:16.16                             |
| 8            | 10:56:34.4           | 0:29:39                           | 0:03:48.8                               | 0:03:45.45                             |
| 9            | 10:57:04.3           | 0:30:09                           | 0:04:18.7                               | 0:04:15.15                             |
| 10           | 10:57:24.3           | 0:30:29                           | 0:04:38.7                               | 0:04:35.35                             |
| 11           | 10:57:24.8           | 0:30:35                           | 0:04:39.2                               | 0:04:41.41                             |
| 12           | 10:57:37.9           | 0:30:43                           | 0:04:52.3                               | 0:04:49.49                             |
| 13           | 10:57:43.5           | 0:30:48                           | 0:04:57.9                               | 0:04:54.54                             |
| 14           | 10:58:09.34          | 0:31:14                           | 0:05:23.74                              | 0:05:20.20                             |
| 15           | 10:58:10.0           | 0:31:15                           | 0:05:24.4                               | 0:05:21.21                             |
| 16           | 10:58:14.6           | 0:31:19                           | 0:05:29.0                               | 0:05:25.25                             |
| 17           | 10:58:33.5           | 0:31:38                           | 0:05:47.9                               | 0:05:44.44                             |
| 18           | 10:58:41.5           | 0:31:46                           | 0:05:55.9                               | 0:05:52.52                             |
| 19           | 10:58:59.9           | 0:32:05                           | 0:06:14.3                               | 0:06:11.11                             |
| 20           | 10:59:07.4           | 0:32:12                           | 0:06:21.8                               | 0:06:18.18                             |
| 21           | 10:59:11.153         | 0:32:16                           | 0:06:25.553                             | 0:06:22.22                             |
| 22           | 10:59:11.160         |                                   | 0:06:25.56                              |                                        |
| 23           | 10:59:33.9           | 0:32:39                           | 0:06:48.3                               | 0:06:45.45                             |
| 24           | 10:59:41.550         | 0:32:46                           | 0:06:55.95                              | 0:06:52.52                             |
| 25           | 10:59:41.556         |                                   | 0:06:55.956                             |                                        |
| 26           | 10:59:45.918         | 0:32:51                           | 0:07:00.318                             | 0:06:57.57                             |
| 27           | 10:59:45.925         |                                   | 0:07:00.325                             |                                        |
| 28           | 10:59:57.9           | 0:33:03                           | 0:07:12.3                               | 0:07:09.9                              |
| 29           | 11:00:18.7           | 0:33:23                           | 0:07:33.1                               | 0:07:29.29                             |
| 30           | 11:00:19.4           | 0:33:24                           | 0:07:33.8                               | 0:07:30.30                             |
| 31           | 11:00:25.8           | 0:33:30                           | 0:07:40.2                               | 0:07:36.36                             |
| 32           | 11:00:28.3           | 0:33:33                           | 0:07:42.7                               | 0:07:39.39                             |
| 33           | 11:00:36.4           | 0:33:41                           | 0:07:50.8                               | 0:07:47.47                             |
| 34           | 11:00:40.885         | 0:33:46                           | 0:07:55.285                             | 0:07:52.52                             |
| 35           | 11:00:40.893         |                                   | 0:07:55.293                             |                                        |
| 36           | 11:00:47.7           | 0:33:52                           | 0:08:02.1                               | 0:07:58.58                             |
| 37           | 11:00:48.0           | 0:33:55                           | 0:08:02.4                               | 0:08:01.1                              |
| 38           | 11:00:51.079         | 0:33:59                           | 0:08:05.479                             | 0:08:05.5                              |
| 39           | 11:00:51.087         |                                   | 0:08:05.487                             |                                        |
| 40           | 11:01:05.2           | 0:34:10                           | 0:08:19.6                               | 0:08:16.16                             |
| 41           | 11:01:13.7           | 0:34:18                           | 0:08:28.1                               | 0:08:24.24                             |
| 42           | 11:01:19.5           | 0:34:24                           | 0:08:33.9                               | 0:08:30.30                             |
| 43           | 11:01:26.6           | 0:34:31                           | 0:08:41.0                               | 0:08:37.37                             |
| 44           | 11:01:38.8           | 0:34:44                           | 0:08:53.2                               | 0:08:50.50                             |
| 45           | 11:01:42.73          | 0:34:47                           | 0:08:57.13                              | 0:08:53.53                             |
| 46           | 11:01:42.99          | 0:34:48                           | 0:08:57.39                              | 0:08:54.54                             |
| 47           | 11:01:43.07          |                                   | 0:08:57.47                              | 0:00:00.0                              |
| 48           | 11:01:45.9           | 0:34:51                           | 0:09:00.3                               | 0:08:57.57                             |

TABLE 4-10. TEST 6 EVENT TIMES (Continued)

| Event Number | Time Code<br>(h:m:s) | W. D. H<br>EVENT TIME*<br>(h:m:s) | Elapsed time:<br>TIME CODE**<br>(h:m:s) | Elapsed time:<br>W. D. H.**<br>(h:m:s) |
|--------------|----------------------|-----------------------------------|-----------------------------------------|----------------------------------------|
| 49           | 11:01:49.0           | 0:34:54                           | 0:09:03.4                               | 0:09:00.0                              |
| 50           | 11:02:03.885         | 0:35:08                           | 0:09:18.285                             | 0:09:14.14                             |
| 51           | 11:02:03.993         |                                   | 0:09:18.293                             |                                        |
| 52           | 11:02:09.654         | 0:35:14                           | 0:09:23.954                             | 0:09:20.20                             |
| 53           | 11:02:09.660         |                                   | 0:09:23.96                              |                                        |
| 54           | 11:02:13.9           | 0:35:19                           | 0:09:28.3                               | 0:09:25.25                             |
| 55           | 11:02:14.8           | 0:35:20                           | 0:09:29.2                               | 0:09:26.26                             |
| 56           | 11:02:26.7           | 0:35:31                           | 0:09:41.1                               | 0:09:37.37                             |
| 57           | 11:02:27.0           | 0:35:32                           | 0:09:41.4                               | 0:09:38.38                             |
| 58           | 11:02:28.34          | 0:35:35                           | 0:09:42.74                              | 0:09:41.41                             |
| 59           | 11:02:29.1           | 0:35:36                           | 0:09:43.5                               | 0:09:42.42                             |
| 60           | 11:02:29.667         | 0:35:37                           | 0:09:44.067                             | 0:09:43.43                             |
| 61           | 11:02:29.676         |                                   | 0:09:44.076                             |                                        |
| 62           | 11:02:39.510         | 0:35:44                           | 0:09:53.91                              | 0:09:50.50                             |
| 63           | 11:02:39.517         |                                   | 0:09:53.917                             |                                        |
| 64           | 11:02:40.0           | 0:35:45                           | 0:09:54.4                               | 0:09:51.51                             |
| 65           | 11:02:41.4           | 0:35:46                           | 0:09:55.8                               | 0:09:52.52                             |
| 66           | 11:02:42.9           | 0:35:48                           | 0:09:57.3                               | 0:09:54.54                             |
| 67           | 11:02:45.4           | 0:35:48                           | 0:09:59.8                               | 0:09:54.54                             |
| 68           | 11:02:47.0           | 0:35:50                           | 0:10:01.4                               | 0:09:56.56                             |
| 69           | 11:02:49.7           | 0:35:51                           | 0:10:04.1                               | 0:09:57.57                             |
| 70           | 11:02:49.8           | 0:35:54                           | 0:10:04.2                               | 0:10:00.0                              |
| 71           | 11:03:00.7           | 0:36:05                           | 0:10:15.1                               | 0:10:11.11                             |
| 72           | 11:03:03.6           | 0:36:08                           | 0:10:18.0                               | 0:10:14.14                             |
| 73           | 11:03:06.2           | 0:36:11                           | 0:10:20.6                               | 0:10:17.17                             |
| 74           | 11:03:13.5           | 0:36:18                           | 0:10:27.9                               | 0:10:24.24                             |
| 75           | 11:03:15.4           | 0:36:20                           | 0:10:29.8                               | 0:10:26.26                             |
| 76           | 11:03:24.5           | 0:36:29                           | 0:10:38.9                               | 0:10:35.35                             |
| 77           | 11:03:25.8           | 0:36:30                           | 0:10:40.2                               | 0:10:36.36                             |
| 78           | 11:03:28.3           | 0:36:33                           | 0:10:42.7                               | 0:10:39.39                             |
| 79           | 11:03:28.4           | 0:36:33                           | 0:10:42.8                               | 0:10:39.39                             |
| 80           | 11:03:31.9           | 0:36:37                           | 0:10:46.3                               | 0:10:43.43                             |
| 81           | 11:03:43.5           | 0:36:48                           | 0:10:57.9                               | 0:10:54.54                             |
| 82           | 11:03:45.3           | 0:36:50                           | 0:10:59.7                               | 0:10:56.56                             |
| 83           | 11:03:47.1           | 0:36:52                           | 0:11:01.5                               | 0:10:58.58                             |
| 84           | 11:03:50.393         | 0:36:55                           | 0:11:04.793                             | 0:11:01.1                              |
| 85           | 11:03:50.399         |                                   | 0:11:04.799                             |                                        |
| 86           | 11:03:52.6           | 0:36:57                           | 0:11:07.0                               | 0:11:03.3                              |
| 87           | 11:03:53.944         | 0:36:58                           | 0:11:08.344                             | 0:11:04.4                              |
| 88           | 11:03:53.952         |                                   | 0:11:08.352                             |                                        |
| 89           | 11:03:59.6           | 0:37:04                           | 0:11:14.0                               | 0:11:10.10                             |
| 90           | 11:04:03.4           | 0:37:08                           | 0:11:17.8                               | 0:11:14.14                             |
| 91           | 11:04:05.162         | 0:37:10                           | 0:11:19.562                             | 0:11:16.16                             |
| 92           | 11:04:05.171         |                                   | 0:11:19.571                             |                                        |
| 93           | 11:04:05.569         | 0:37:10                           | 0:11:19.969                             | 0:11:16.16                             |
| 94           | 11:04:05.576         |                                   | 0:11:19.976                             |                                        |
| 95           | 11:04:17.8           | 0:37:22                           | 0:11:32.2                               | 0:11:28.28                             |
| 96           | 11:04:18.8           | 0:37:23                           | 0:11:33.2                               | 0:11:29.29                             |

TABLE 4-10. TEST 6 EVENT TIMES (Continued)

| Event Number | Time Code<br>(h:m:s) | W. D. H<br>EVENT TIME*<br>(h:m:s) | Elapsed time:<br>TIME CODE**<br>(h:m:s) | Elapsed time:<br>W. D. H.**<br>(h:m:s) |
|--------------|----------------------|-----------------------------------|-----------------------------------------|----------------------------------------|
| 97           | 11:04:21.971         | 0:37:27                           | 0:11:36.371                             | 0:11:33.33                             |
| 98           | 11:04:21.983         |                                   | 0:11:36.383                             |                                        |
| 99           | 11:04:25.4           | 0:37:30                           | 0:11:39.8                               | 0:11:36.36                             |
| 100          | 11:04:34.3           | 0:37:39                           | 0:11:48.7                               | 0:11:45.45                             |
| 101          | 11:04:34.5           | 0:37:39                           | 0:11:48.9                               | 0:11:45.45                             |
| 102          | 11:04:35.5           | 0:37:40                           | 0:11:49.9                               | 0:11:46.46                             |
| 103          | 11:04:40.3           | 0:37:45                           | 0:11:54.7                               | 0:11:51.51                             |
| 104          | 11:04:44.6           | 0:37:49                           | 0:11:59.0                               | 0:11:55.55                             |
| 105          | 11:04:47.8           | 0:37:52                           | 0:12:02.2                               | 0:11:58.58                             |
| 106          | 11:04:48.1           | 0:37:53                           | 0:12:02.5                               | 0:11:59.59                             |
| 107          | 11:04:52.6           | 0:37:57                           | 0:12:07.0                               | 0:12:03.3                              |
| 108          | 11:04:55.2           | 0:38:00                           | 0:12:09.6                               | 0:12:06.6                              |
| 109          | 11:05:00.9           | 0:38:05                           | 0:12:15.3                               | 0:12:11.11                             |
| 110          | 11:05:02.52          | 0:38:07                           | 0:12:16.92                              | 0:12:13.13                             |
| 111          | 11:05:02.89          | 0:38:08                           | 0:12:17.29                              | 0:12:14.14                             |
| 112          | 11:05:03.91          | 0:38:09                           | 0:12:18.31                              | 0:12:15.15                             |
| 113          | 11:05:04.388         | 0:38:09                           | 0:12:18.738                             | 0:12:15.15                             |
| 114          | 11:05:04.399         |                                   | 0:12:18.749                             |                                        |
| 115          | 11:05:09.0           | 0:38:14                           | 0:12:23.4                               | 0:12:20.20                             |
| 116          | 11:05:10.2           | 0:38:15                           | 0:12:24.6                               | 0:12:21.21                             |
| 117          | 11:05:20.4           | 0:38:25                           | 0:12:34.8                               | 0:12:31.31                             |
| 118          | 11:05:21.8           | 0:38:26                           | 0:12:36.2                               | 0:12:32.32                             |
| 119          | 11:05:28.1           | 0:38:33                           | 0:12:42.5                               | 0:12:39.39                             |
| 120          | 11:05:31.8           | 0:38:36                           | 0:12:46.2                               | 0:12:42.42                             |
| 121          | 11:05:33.4           | 0:38:39                           | 0:12:47.8                               | 0:12:45.45                             |
| 122          | 11:05:33.6           | 0:38:39                           | 0:12:48.0                               | 0:12:45.45                             |
| 123          | 11:05:40.2           | 0:38:45                           | 0:12:54.6                               | 0:12:51.51                             |
| 124          | 11:05:46.5           | 0:38:51                           | 0:13:00.9                               | 0:12:57.57                             |
| 125          | 11:05:47.7           | 0:38:52                           | 0:13:02.1                               | 0:12:58.58                             |
| 126          | 11:05:50.0           | 0:38:55                           | 0:13:04.4                               | 0:13:01.1                              |
| 127          | 11:05:54.2           | 0:38:59                           | 0:13:08.6                               | 0:13:05.5                              |
| 128          | 11:05:57.68          | 0:39:02                           | 0:13:12.08                              | 0:13:08.8                              |
| 129          | 11:05:57.69          | 0:39:03                           | 0:13:12.09                              | 0:13:09.9                              |
| 130          | 11:05:58.1           | 0:39:04                           | 0:13:12.5                               | 0:13:10.10                             |
| 131          | 11:05:59.0           | 0:39:04                           | 0:13:13.4                               | 0:13:10.10                             |
| 132          | 11:06:02.9           | 0:39:08                           | 0:13:17.3                               | 0:13:14.14                             |
| 133          | 11:06:08.3           | 0:39:13                           | 0:13:22.7                               | 0:13:19.19                             |
| 134          | 11:06:09.9           | 0:39:14                           | 0:13:24.3                               | 0:13:20.20                             |
| 135          | 11:06:16.5           | 0:39:21                           | 0:13:30.9                               | 0:13:27.27                             |
| 136          | 11:06:20.337         | 0:39:25                           | 0:13:34.737                             | 0:13:31.31                             |
| 137          | 11:06:20.344         |                                   | 0:13:34.744                             |                                        |
| 138          | 11:06:21.1           | 0:39:26                           | 0:13:35.5                               | 0:13:32.32                             |
| 139          | 11:06:22.9           | 0:39:28                           | 0:13:37.3                               | 0:13:34.34                             |
| 140          | 11:06:28.1           | 0:39:33                           | 0:13:42.5                               | 0:13:39.39                             |
| 141          | 11:06:33.0           | 0:39:37                           | 0:13:47.4                               | 0:13:43.43                             |
| 142          | 11:06:41.2           | 0:39:46                           | 0:13:55.6                               | 0:13:52.52                             |
| 143          | 11:06:41.7           | 0:39:46                           | 0:13:56.1                               | 0:13:52.52                             |
| 144          | 11:06:46.0           | 0:39:51                           | 0:14:00.4                               | 0:13:57.57                             |

TABLE 4-10. TEST 6 EVENT TIMES (Continued)

| Event Number | Time Code<br>(h:m:s) | W. D. H<br>EVENT TIME*<br>(h:m:s) | Elapsed time:<br>TIME CODE**<br>(h:m:s) | Elapsed time:<br>W. D. H.**<br>(h:m:s) |
|--------------|----------------------|-----------------------------------|-----------------------------------------|----------------------------------------|
| 145          | 11:06:48.9           | 0:39:53                           | 0:14:03.3                               | 0:13:59.59                             |
| 146          | 11:06:54.6           | 0:39:59                           | 0:14:09.0                               | 0:14:05.5                              |
| 147          | 11:06:57.0           | 0:40:02                           | 0:14:11.4                               | 0:14:08.8                              |
| 148          | 11:07:00.9           | 0:40:05                           | 0:14:15.3                               | 0:14:11.11                             |
| 149          | 11:07:05.111         | 0:40:10                           | 0:14:19.511                             | 0:14:16.16                             |
| 150          | 11:07:05.119         |                                   | 0:14:19.519                             |                                        |
| 151          | 11:07:05.5           | 0:40:10                           | 0:14:19.9                               | 0:14:16.16                             |
| 152          | 11:07:05.7           | 0:40:10                           | 0:14:20.1                               | 0:14:16.16                             |
| 153          | 11:07:10.3           | 0:40:14                           | 0:14:24.7                               | 0:14:20.20                             |
| 154          | 11:07:11.0           | 0:40:16                           | 0:14:25.4                               | 0:14:22.22                             |
| 155          | 11:07:13.1           | 0:40:18                           | 0:14:27.5                               | 0:14:24.24                             |
| 156          | 11:07:17.8           | 0:40:22                           | 0:14:32.2                               | 0:14:28.28                             |
| 157          | 11:07:18.265         | 0:40:24                           | 0:14:32.670                             | 0:14:30.30                             |
| 158          | 11:07:18.270         |                                   | 0:14:32.665                             |                                        |
| 159          | 11:07:23.0           | 0:40:28                           | 0:14:37.4                               | 0:14:34.34                             |
| 160          | 11:07:25.1           | 0:40:30                           | 0:14:39.5                               | 0:14:36.36                             |
| 161          | 11:07:26.631         | 0:40:31                           | 0:14:41.031                             | 0:14:37.37                             |
| 162          | 11:07:26.639         |                                   | 0:14:41.039                             |                                        |
| 163          | 11:07:34.3           | 0:40:39                           | 0:14:48.7                               | 0:14:45.45                             |
| 164          | 11:07:36.8           | 0:40:42                           | 0:14:51.2                               | 0:14:48.48                             |
| 165          | 11:07:40.1           | 0:40:45                           | 0:14:54.5                               | 0:14:51.51                             |
| 166          | 11:07:42.223         | 0:40:47                           | 0:14:56.623                             | 0:14:53.53                             |
| 167          | 11:07:42.231         |                                   | 0:14:56.631                             |                                        |
| 168          | 11:07:43.3           | 0:40:48                           | 0:14:57.7                               | 0:14:54.54                             |
| 169          | 11:07:44.1           | 0:40:49                           | 0:14:58.5                               | 0:14:55.55                             |
| 170          | 11:07:44.5           | 0:40:49                           | 0:14:58.9                               | 0:14:55.55                             |
| 171          | 11:07:46.1           | 0:40:52                           | 0:15:00.5                               | 0:14:58.58                             |
| 172          | 11:07:47.805         |                                   | 0:15:02.205                             |                                        |
| 173          | 11:07:47.815         |                                   | 0:15:02.215                             |                                        |
| 174          | 11:07:50.4           | 0:40:55                           | 0:15:04.8                               | 0:15:01.1                              |
| 175          | 11:07:58.1           | 0:41:03                           | 0:15:12.5                               | 0:15:09.9                              |
| 176          | 11:08:00.2           | 0:41:05                           | 0:15:14.6                               | 0:15:11.11                             |
| 177          | 11:08:01.4           | 0:41:06                           | 0:15:15.8                               | 0:15:12.12                             |
| 178          | 11:08:03.5           | 0:41:08                           | 0:15:17.9                               | 0:15:14.14                             |
| 179          | 11:08:05.3           | 0:41:10                           | 0:15:19.7                               | 0:15:16.16                             |
| 180          | 11:08:06.3           | 0:41:11                           | 0:15:20.7                               | 0:15:17.17                             |
| 181          | 11:08:14.0           | 0:41:19                           | 0:15:28.4                               | 0:15:25.25                             |
| 182          | 11:08:14.1           |                                   | 0:15:28.5                               |                                        |
| 183          | 11:08:20.5           | 0:41:25                           | 0:15:34.9                               | 0:15:31.31                             |
| 184          | 11:08:22.0           | 0:41:27                           | 0:15:36.4                               | 0:15:33.33                             |
| 185          | 11:08:25.5           | 0:41:30                           | 0:15:39.9                               | 0:15:36.36                             |
| 186          | 11:08:25.9           | 0:41:31                           | 0:15:40.3                               | 0:15:37.37                             |
| 187          | 11:08:31.0           | 0:41:36                           | 0:15:45.4                               | 0:15:42.42                             |
| 188          | 11:08:40.7           | 0:41:45                           | 0:15:55.1                               | 0:15:51.51                             |
| 189          | 11:08:42.6           | 0:41:47                           | 0:15:57.0                               | 0:15:53.53                             |
| 190          | 11:08:45.2           | 0:41:50                           | 0:15:59.6                               | 0:15:56.56                             |
| 191          | 11:08:51.3           | 0:41:56                           | 0:16:05.7                               | 0:16:02.2                              |
| 192          | 11:08:52.5           | 0:41:57                           | 0:16:06.9                               | 0:16:03.3                              |

TABLE 4-10. TEST 6 EVENT TIMES (Continued)

| Event Number | Time Code<br>(h:m:s) | W. D. H<br>EVENT TIME*<br>(h:m:s) | Elapsed time:<br>TIME CODE**<br>(h:m:s) | Elapsed time:<br>W. D. H.**<br>(h:m:s) |
|--------------|----------------------|-----------------------------------|-----------------------------------------|----------------------------------------|
| 193          | 11:08:53.7           | 0:41:58                           | 0:16:08.1                               | 0:16:04.4                              |
| 194          | 11:08:55.3           | 0:42:00                           | 0:16:09.7                               | 0:16:06.6                              |
| 195          | 11:08:56.1           | 0:42:01                           | 0:16:10.5                               | 0:16:07.7                              |
| 196          | 11:08:58.2           | 0:42:03                           | 0:16:12.6                               | 0:16:09.9                              |
| 197          | 11:09:01.1           | 0:42:06                           | 0:16:15.6                               | 0:16:12.12                             |
| 198          | 11:09:05.0           | 0:42:09                           | 0:16:19.4                               | 0:16:15.15                             |
| 199          | 11:09:11.8           | 0:42:16                           | 0:16:26.2                               | 0:16:22.22                             |
| 200          | 11:09:12.0           | 0:42:17                           | 0:16:26.4                               | 0:16:23.23                             |
| 201          | 11:09:19.5           | 0:42:25                           | 0:16:33.9                               | 0:16:31.31                             |
| 202          | 11:09:21.36          | 0:42:27                           | 0:16:35.76                              | 0:16:33.33                             |
| 203          | 11:09:21.42          |                                   | 0:16:35.82                              |                                        |
| 204          | 11:09:25.4           | 0:42:30                           | 0:16:39.8                               | 0:16:36.36                             |
| 205          | 11:09:30.2           | 0:42:35                           | 0:16:44.6                               | 0:16:41.41                             |
| 206          | 11:09:33.40          | 0:42:38                           | 0:16:47.8                               | 0:16:44.44                             |
| 207          | 11:09:33.7           | 0:42:38                           | 0:16:48.11                              | 0:16:44.44                             |
| 208          | 11:09:33.75          |                                   | 0:16:48.15                              |                                        |
| 209          | 11:09:36.0           | 0:42:40                           | 0:16:50.4                               | 0:16:46.46                             |
| 210          | 11:09:38.0           | 0:42:43                           | 0:16:52.4                               | 0:16:49.49                             |
| 211          | 11:09:38.6           | 0:42:43                           | 0:16:53.0                               | 0:16:49.49                             |
| 212          | 11:09:40.9           | 0:42:45                           | 0:16:55.3                               | 0:16:51.51                             |
| 213          | 11:10:02.6           | 0:43:07                           | 0:17:17.0                               | 0:17:13.13                             |
| 214          | 11:10:02.9           | 0:43:08                           | 0:17:17.3                               | 0:17:14.14                             |
| 215          | 11:10:03.3           | 0:43:08                           | 0:17:17.7                               | 0:17:14.14                             |
| 216          | 11:10:04.3           | 0:43:09                           | 0:17:18.7                               | 0:17:15.15                             |
| 217          | 11:10:09.5           | 0:43:14                           | 0:17:23.9                               | 0:17:20.20                             |
| 218          | 11:10:09.940         | 0:43:15                           | 0:17:24.340                             | 0:17:21.21                             |
| 219          | 11:10:09.949         |                                   | 0:17:24.349                             |                                        |
| 220          | 11:10:10.6           | 0:43:16                           | 0:17:25.0                               | 0:17:22.22                             |
| 221          | 11:10:10.61          |                                   | 0:17:25.01                              |                                        |
| 222          | 11:10:20.87          | 0:43:26                           | 0:17:35.27                              | 0:17:32.32                             |
| 223          | 11:10:21.04          |                                   | 0:17:35.44                              |                                        |
| 224          | 11:10:23.6           | 0:43:28                           | 0:17:38.0                               | 0:17:34.34                             |
| 225          | 11:10:27.280         | 0:43:32                           | 0:17:41.680                             | 0:17:38.38                             |
| 226          | 11:10:27.288         |                                   | 0:17:41.688                             |                                        |
| 227          | 11:10:28.734         | 0:43:33                           | 0:17:43.134                             | 0:17:39.39                             |
| 228          | 11:10:28.740         |                                   | 0:17:43.140                             |                                        |
| 229          | 11:10:30.0           | 0:43:35                           | 0:17:44.4                               | 0:17:41.41                             |
| 230          | 11:10:47.7           | 0:43:52                           | 0:18:02.1                               | 0:17:58.58                             |
| 231          | 11:10:50.0           | 0:43:56                           | 0:18:04.4                               | 0:18:02.2                              |
| 232          | 11:10:51.9           | 0:43:57                           | 0:18:06.3                               | 0:18:03.3                              |
| 233          | 11:10:55.375         | 0:44:00                           | 0:18:09.775                             | 0:18:06.6                              |
| 234          | 11:10:55.384         |                                   | 0:18:09.784                             |                                        |
| 235          | 11:10:56.6           | 0:44:01                           | 0:18:11.0                               | 0:18:07.7                              |
| 236          | 11:10:58.63          | 0:44:03                           | 0:18:13.03                              | 0:18:09.9                              |
| 237          | 11:10:58.93          |                                   | 0:18:13.33                              |                                        |
| 238          | 11:10:59.03          |                                   | 0:18:13.43                              |                                        |
| 239          | 11:11:01.8           | 0:44:06                           | 0:18:15.93                              | 0:18:12.12                             |
| 240          | 11:11:02.3           | 0:44:07                           | 0:18:16.43                              | 0:18:13.13                             |

TABLE 4-10. TEST 6 EVENT TIMES (Continued)

| Event Number | Time Code<br>(h:m:s) | W. D. H<br>EVENT TIME*<br>(h:m:s) | Elapsed time:<br>TIME CODE**<br>(h:m:s) | Elapsed time:<br>W. D. H.**<br>(h:m:s) |
|--------------|----------------------|-----------------------------------|-----------------------------------------|----------------------------------------|
| 241          | 11:11:03.2           | 0:44:08                           | 0:18:17.33                              | 0:18:14.14                             |
| 242          | 11:11:05.3           | 0:44:10                           | 0:18:19.43                              | 0:18:16.16                             |
| 243          | 11:11:07.8           | 0:44:12                           | 0:18:21.93                              | 0:18:18.18                             |
| 244          | 11:11:11.0           | 0:44:15                           | 0:18:25.13                              | 0:18:21.21                             |
| 245          | 11:11:12.2           | 0:44:17                           | 0:18:26.33                              | 0:18:23.23                             |
| 246          | 11:11:13.8           | 0:44:18                           | 0:18:27.93                              | 0:18:24.24                             |
| 247          | 11:11:14.86          | 0:44:19                           | 0:18:28.99                              | 0:18:25.25                             |
| 248          | 11:11:14.87          | 0:44:20                           | 0:18:29.0                               | 0:18:26.26                             |
| 249          | 11:11:24.6           | 0:44:29                           | 0:18:38.73                              | 0:18:35.35                             |
| 250          | 11:11:26.1           | 0:44:31                           | 0:18:40.23                              | 0:18:37.37                             |
| 251          | 11:11:27.42          | 0:44:32                           | 0:18:41.55                              | 0:18:38.38                             |
| 252          | 11:11:27.43          |                                   | 0:18:41.56                              |                                        |
| 253          | 11:11:30.6           | 0:44:35                           | 0:18:44.73                              | 0:18:41.41                             |
| 254          | 11:11:43.8           | 0:44:48                           | 0:18:57.93                              | 0:18:54.54                             |
| 255          | 11:11:45.3           | 0:44:50                           | 0:18:59.43                              | 0:18:56.56                             |
| 256          | 11:11:50.3           | 0:44:55                           | 0:19:04.43                              | 0:19:01.1                              |
| 257          | 11:11:51.1           | 0:44:56                           | 0:19:05.23                              | 0:19:02.2                              |
| 258          | 11:11:52.9           |                                   | 0:19:07.03                              |                                        |
| 259          | 11:11:57.3           | 0:45:02                           | 0:19:11.43                              | 0:19:08.8                              |
| 260          | 11:11:59.6           | 0:45:04                           | 0:19:13.73                              | 0:19:10.10                             |
| 261          | 11:12:03.0           | 0:45:08                           | 0:19:17.13                              | 0:19:14.14                             |
| 262          | 11:12:10.468         | 0:45:15                           | 0:19:24.868                             | 0:19:21.21                             |
| 263          | 11:12:10.472         |                                   | 0:19:24.872                             |                                        |
| 264          | 11:12:14.0           | 0:45:19                           | 0:19:28.13                              | 0:19:25.25                             |
| 265          | 11:12:14.9           | 0:45:20                           | 0:19:29.03                              | 0:19:26.26                             |
| 266          | 11:12:15.8           | 0:45:20                           | 0:19:29.93                              | 0:19:26.26                             |
| 267          | 11:12:18.4           | 0:45:23                           | 0:19:32.53                              | 0:19:29.29                             |
| 268          | 11:12:30.8           | 0:45:35                           | 0:19:44.93                              | 0:19:41.41                             |
| 269          | 11:12:40.2           | 0:45:45                           | 0:19:54.33                              | 0:19:51.51                             |
| 270          | 11:12:42.6           | 0:45:46                           | 0:19:56.73                              | 0:19:52.52                             |
| 271          | 11:12:45.2           | 0:45:50                           | 0:19:59.33                              | 0:19:56.56                             |
| 272          | 11:12:54.3           | 0:45:59                           | 0:20:08.43                              | 0:20:05.5                              |
| 273          | 11:13:22.0           | 0:46:27                           | 0:20:36.0                               | 0:20:33.33                             |
| 274          | 11:13:25.4           | 0:46:30                           | 0:20:39.4                               | 0:20:36.36                             |
| 275          | 11:13:33.3           | 0:46:38                           | 0:20:47.3                               | 0:20:44.44                             |
| 276          | 11:13:38.9           | 0:46:43                           | 0:20:52.9                               | 0:20:49.49                             |
| 277          | 11:13:51.1           | 0:46:56                           | 0:21:05.1                               | 0:21:02.2                              |
| 278          | 11:13:54.3           | 0:46:59                           | 0:21:08.2                               | 0:21:05.5                              |
| 279          | 11:14:00.8           | 0:47:06                           | 0:21:14.7                               | 0:21:12.12                             |
| 280          | 11:14:04.11          | 0:47:10                           | 0:21:18.01                              | 0:21:16.16                             |
| 281          | 11:14:04.17          | 0:47:10                           | 0:21:18.07                              | 0:21:16.16                             |
| 282          | 11:14:08.1           | 0:47:13                           | 0:21:22.22                              | 0:21:19.19                             |
| 283          | 11:14:09.2           | 0:47:14                           | 0:21:23.1                               | 0:21:20.20                             |
| 284          | 11:14:09.92          | 0:47:15                           | 0:21:23.82                              | 0:21:21.21                             |
| 285          | 11:14:09.93          |                                   | 0:21:23.83                              |                                        |
| 286          | 11:14:23.4           | 0:47:28                           | 0:21:37.3                               | 0:21:34.34                             |
| 287          | 11:14:29.1           | 0:47:34                           | 0:21:43.0                               | 0:21:40.40                             |
| 288          | 11:14:34.2           | 0:47:39                           | 0:21:48.1                               | 0:21:45.45                             |

TABLE 4-10. TEST 6 EVENT TIMES (Continued)

| Event Number | Time Code<br>(h:m:s) | W. D. H<br>EVENT TIME*<br>(h:m:s) | Elapsed time:<br>TIME CODE**<br>(h:m:s) | Elapsed time:<br>W. D. H.**<br>(h:m:s) |
|--------------|----------------------|-----------------------------------|-----------------------------------------|----------------------------------------|
| 289          | 11:14:57.1           | 0:48:02                           | 0:22:11.0                               | 0:22:08.8                              |
| 290          | 11:15:07.4           | 0:48:12                           | 0:22:21.3                               | 0:22:18.18                             |
| 291          | 11:15:19.7           | 0:48:24                           | 0:22:33.6                               | 0:22:30.30                             |
| 292          | 11:15:38.9           | 0:48:44                           | 0:22:52.8                               | 0:22:50.50                             |
| 293          | 11:15:48.3           | 0:48:53                           | 0:23:02.2                               | 0:22:59.59                             |
| 294          | 11:16:03.9           | 0:49:09                           | 0:23:17.8                               | 0:23:15.15                             |
| 295          | 11:16:05.2           | 0:49:10                           | 0:23:19.1                               | 0:23:16.16                             |
| 296          | 11:16:14.3           | 0:49:19                           | 0:23:28.2                               | 0:23:25.25                             |
| 297          | 11:16:23.69          | 0:49:28                           | 0:23:37.59                              | 0:23:34.34                             |
| 298          | 11:16:23.7           | 0:49:29                           | 0:23:37.6                               | 0:23:35.35                             |
| 299          | 11:16:26.7           | 0:49:32                           | 0:23:40.6                               | 0:23:38.38                             |
| 300          | 11:16:38.1           | 0:49:44                           | 0:23:52.0                               | 0:23:50.50                             |
| 301          | 11:17:06.3           | 0:50:11                           | 0:24:20.2                               | 0:24:17.17                             |
| 302          | 11:17:06.9           | 0:50:12                           | 0:24:20.8                               | 0:24:18.18                             |
| 303          | 11:17:53.2           | 0:50:58                           | 0:25:07.1                               | 0:25:04.4                              |
| 304          | 11:18:05.6           | 0:51:10                           | 0:25:19.5                               | 0:25:16.16                             |
| 305          | 11:18:16.0           | 0:51:21                           | 0:25:29.9                               | 0:25:27.27                             |
| 306          | 11:19:15.8           | 0:52:21                           | 0:26:29.7                               | 0:26:27.27                             |
| 307          | 11:19:25.184         | 0:52:30                           | 0:26:39.584                             | 0:26:36.36                             |
| 308          | 11:19:25.188         |                                   | 0:26:39.588                             |                                        |
| 309          | 11:20:14.5           | 0:53:20                           | 0:27:28.4                               | 0:27:26.26                             |
| 310          | 11:20:19.7           | 0:53:24                           | 0:27:33.6                               | 0:27:30.30                             |
| 311          | 11:20:23.5           | 0:53:29                           | 0:27:37.4                               | 0:27:35.35                             |
| 312          | 11:21:00.0           | 0:54:05                           | 0:28:13.9                               | 0:28:11.11                             |
| 313          | 11:21:01.4           | 0:54:06                           | 0:28:15.3                               | 0:28:12.12                             |
| 314          | 11:22:20.0           | 0:55:25                           | 0:29:33.9                               | 0:29:31.31                             |
| 315          | 11:24:01.9           | 0:57:08                           | 0:31:15.8                               | 0:31:14.14                             |
| 316          | 11:24:28.3           | 0:57:34                           | 0:31:42.2                               | 0:31:40.40                             |
| 317          | 11:27:45.0           | 1:00:43                           | 0:34:58.9                               | 0:34:49.49                             |
| 318          | 11:27:52.5           | 1:00:57                           | 0:35:06.4                               | 0:35:03.3                              |
| 319          | 11:29:30.4           | 1:02:36                           | 0:36:44.3                               | 0:36:42.42                             |
| 320          | 11:29:33.3           | 1:02:42                           | 0:36:47.2                               | 0:36:48.48                             |
| 321          | 11:31:40.0           | 1:04:46                           | 0:38:53.9                               | 0:38:52.52                             |
| 322          | 11:38:53.6           | 1:12:00                           | 0:46:07.5                               | 0:46:06.6                              |
| 323          | 11:40:30.4           | 1:13:36                           | 0:47:44.3                               | 0:47:42.42                             |
| 324          | 11:40:31.4           | 1:13:37                           | 0:47:45.3                               | 0:47:43.43                             |

\* referenced to start of fire--W. D. H. is an on-site observer

\*\*measured from the first event

TABLE 4-11. TEST 6 PRESSURE DATA

| Event<br>Number | PEAK PRESSURE (psi) |                 |                 |                  |                 |                 |                 |                  |                 |                  |                  |                   |
|-----------------|---------------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|------------------|-----------------|------------------|------------------|-------------------|
|                 | POSITION NUMBER     |                 |                 |                  |                 |                 |                 |                  |                 |                  |                  |                   |
|                 | P1<br>(48.9 ft)     | P2<br>(69.1 ft) | P3<br>(98.3 ft) | P4<br>(199.3 ft) | P5<br>(49.6 ft) | P6<br>(69.9 ft) | P7<br>(99.2 ft) | P8<br>(199.5 ft) | P9<br>(48.9 ft) | P10<br>(68.7 ft) | P11<br>(98.9 ft) | P12<br>(198.6 ft) |
| 1               | NR                  | 0.07            | 0.07            | 0.03             | 0.09            | 0.05            | 0.04            | 0.01             | 0.36            | 0.22             | 0.09             | 0.05              |
| 2               | NR                  | 0.13            | 0.13            | 0.06             | 0.15            | 0.08            | 0.05            | 0.03             | 0.62            | 0.44             | 0.17             | 0.10              |
| 3               | NR                  | 0.37            | 0.30            | 0.12             | 1.83            | 1.05            | 0.55            | 0.21             | 0.85            | 0.57             | 0.26             | 0.13              |
| 4               | NR                  | 0.15            | 0.15            | 0.13             | 2.80            | 1.20            | 0.71            | 0.24             | 0.46            | 0.32             | 0.17             | 0.14              |
| 5               | NR                  | 0.16            | 0.16            | 0.07             | 0.18            | 0.10            | 0.08            | 0.04             | 0.78            | 0.47             | 0.19             | 0.09              |
| 6               | NR                  | 0.06            | 0.05            | 0.04             | 0.44            | 0.24            | 0.12            | 0.06             | 0.39            | 0.25             | 0.13             | 0.07              |
| 7               | NR                  | 0.03            | 0.03            | 0.02             | 0.43            | 0.15            | 0.06            | 0.03             | 0.16            | 0.14             | 0.07             | 0.04              |
| 8               | NR                  | 0.08            | 0.08            | 0.04             | NR              | 0.06            | 0.05            | 0.02             | 0.34            | 0.23             | 0.10             | 0.05              |
| 9               | NR                  | 0.59            | 0.38            | 0.18             | 0.21            | 0.89            | 0.45            | 0.22             | 0.35            | 0.30             | 0.17             | 0.10              |
| 10              | NR                  | 0.11            | 0.11            | 0.05             | 0.18            | 0.14            | 0.07            | 0.05             | 0.66            | 0.39             | 0.17             | 0.10              |
| 11              | NR                  | 0.06            | 0.05            | 0.03             | 0.10            | 0.05            | 0.04            | 0.03             | 0.22            | 0.14             | 0.08             | 0.05              |
| 12              | NR                  | 0.43            | 0.35            | 0.20             | 0.24            | 1.54            | 0.80            | 0.36             | 0.98            | 0.72             | 0.33             | 0.17              |
| 13              | NR                  | 0.34            | 0.22            | 0.07             | NR              | 0.09            | 0.07            | 0.03             | 0.30            | 0.22             | 0.12             | 0.06              |
| 14              | NR                  | 0.25            | 0.27            | 0.11             | 0.05            | 0.15            | 0.09            | 0.05             | 0.89            | 0.64             | 0.24             | 0.11              |
| 15              | NR                  | 0.28            | 0.21            | 0.13             | 0.08            | 0.84            | 0.76            | 0.33             | 0.26            | 0.11             | 0.07             | 0.04              |
| 16              | NR                  | 0.63            | 0.46            | 0.15             | NR              | 0.23            | 0.16            | 0.09             | 0.82            | 0.48             | 0.21             | 0.10              |
| 17              | NR                  | 0.42            | 0.38            | 0.15             | 1.07            | 0.68            | 0.51            | 0.20             | 0.84            | 0.57             | 0.28             | 0.16              |
| 18              | NR                  | 0.34            | 0.27            | 0.14             | 1.85            | 1.30            | 0.62            | 0.28             | 0.20            | 0.17             | 0.10             | 0.07              |
| 19              | NR                  | 0.13            | 0.12            | 0.05             | 0.10            | 0.41            | 0.31            | 0.16             | 0.88            | 0.61             | 0.24             | 0.12              |
| 20              | NR                  | 0.81            | 0.53            | 0.22             | 0.82            | 0.55            | 0.37            | 0.20             | 1.66            | 1.09             | 0.51             | 0.24              |
| 21              | NR                  | 0.63            | 0.38            | 0.15             | 1.78            | 1.23            | 0.57            | 0.20             | 0.26            | 0.22             | 0.13             | 0.08              |
| 22              | NR                  | 0.56            | 0.42            | 0.15             | 2.60            | 0.55            | 0.30            | 0.10             | 0.38            | 0.23             | 0.09             | 0.08              |
| 23              | NR                  | 0.16            | 0.16            | 0.07             | 0.25            | 0.21            | 0.12            | 0.06             | 0.52            | 0.38             | 0.18             | 0.10              |
| 24              | NR                  | 0.96            | 0.57            | 0.20             | 1.67            | 0.75            | 0.48            | 0.20             | 0.51            | 0.49             | 0.27             | 0.12              |
| 25              | NR                  | 0.50            | 0.38            | 0.24             | 2.50            | 0.53            | 0.45            | 0.27             | 0.33            | 0.47             | 0.27             | 0.16              |
| 26              | NR                  | 0.90            | 0.52            | 0.19             | 0.90            | 0.75            | 0.32            | 0.14             | 0.33            | 0.25             | 0.21             | 0.11              |
| 27              | NR                  | 0.71            | 0.41            | 0.33             | 1.40            | 0.85            | 0.61            | 0.20             | 0.34            | 0.11             | 0.08             | 0.04              |
| 28              | NR                  | 0.60            | 0.52            | 0.23             | 0.80            | 0.37            | 0.23            | 0.12             | 1.36            | 0.91             | 0.43             | 0.19              |
| 29              | NR                  | 0.23            | 0.21            | 0.11             | 0.27            | 0.18            | 0.14            | 0.09             | 0.66            | 0.17             | 0.19             | 0.08              |
| 30              | NR                  | 0.15            | 0.15            | 0.10             | 0.25            | 0.15            | 0.12            | 0.08             | 0.44            | 0.11             | 0.14             | 0.06              |
| 31              | NR                  | 0.16            | 0.16            | 0.12             | 0.45            | 0.34            | 0.24            | 0.12             | 1.17            | 0.18             | 0.28             | 0.13              |
| 32              | NR                  | 0.79            | 0.46            | 0.17             | 0.92            | 0.53            | 0.33            | 0.17             | 0.63            | 0.11             | 0.28             | 0.13              |
| 33              | NR                  | 0.17            | 0.20            | 0.10             | 0.80            | 0.84            | 0.46            | 0.14             | 1.07            | 0.11             | 0.31             | 0.14              |
| 34              | NR                  | 0.51            | 0.43            | 0.20             | 2.27            | 1.38            | 0.73            | 0.21             | 0.57            | 0.06             | 0.22             | 0.13              |
| 35              | NR                  | 0.42            | 0.31            | 0.18             | 4.00            | 2.00            | 0.95            | 0.33             | 0.37            | 0.04             | 0.20             | 0.90              |
| 36              | NR                  | 0.17            | 0.17            | 0.07             | 0.17            | 0.15            | 0.09            | 0.04             | 1.26            | 0.08             | 0.25             | 0.10              |
| 37              | NR                  | 0.42            | 0.31            | 0.14             | 0.35            | 0.40            | 0.21            | 0.08             | 1.37            | 0.13             | 0.38             | 0.16              |
| 38              | NR                  | 0.17            | 0.15            | 0.08             | 0.08            | 0.11            | 0.06            | 0.03             | 0.82            | 0.07             | 0.17             | 0.00              |
| 39              | NR                  | 0.12            | 0.12            | 0.06             | 0.12            | 0.15            | 0.10            | 0.06             | 0.73            | 0.06             | 0.12             | NR                |
| 40              | NR                  | 0.43            | 0.35            | 0.16             | 1.92            | 1.51            | 0.87            | 0.26             | 0.32            | 0.03             | 0.19             | NR                |
| 41              | NR                  | 0.10            | 0.09            | 0.04             | 0.36            | 0.35            | 0.25            | 0.07             | 0.46            | 0.10             | 0.22             | 0.11              |
| 42              | NR                  | 0.59            | 0.45            | 0.20             | 0.47            | 0.35            | 0.23            | 0.14             | 0.98            | 0.31             | 0.32             | 0.14              |
| 43              | NR                  | 0.25            | 0.28            | 0.15             | 0.62            | 0.37            | 0.28            | 0.10             | 0.55            | 0.24             | 0.17             | 0.09              |
| 44              | NR                  | 0.48            | 0.37            | 0.15             | 0.23            | 0.16            | 0.10            | 0.06             | 0.57            | 0.46             | 0.27             | 0.13              |
| 45              | NR                  | 0.22            | 0.21            | 0.11             | 1.85            | 0.94            | 0.66            | 0.28             | 0.89            | 0.78             | 0.31             | 0.14              |
| 46              | NR                  | 0.27            | 0.21            | 0.10             | 0.71            | 0.35            | 0.14            | 0.06             | 0.24            | 0.18             | 0.12             | 0.01              |
| 47              | NR                  | 0.36            | 0.35            | 0.10             | 0.97            | 0.53            | 0.16            | 0.07             | 0.28            | 0.25             | 0.13             | 0.09              |
| 48              | NR                  | 0.44            | 0.42            | 0.15             | 1.45            | 0.84            | 0.41            | 0.28             | 0.37            | 0.28             | 0.17             | 0.09              |
| 49              | NR                  | 0.30            | 0.27            | 0.15             | 0.36            | 0.23            | 0.16            | 0.08             | 0.39            | 0.27             | 0.15             | 0.07              |
| 50              | NR                  | 0.74            | 0.47            | 0.14             | 0.47            | 0.29            | 0.17            | 0.10             | 0.49            | 0.43             | 0.22             | 0.12              |
| 51              | NR                  | 0.52            | 0.22            | 0.18             | 0.72            | 0.18            | 0.13            | 0.13             | 0.85            | 0.55             | 0.26             | 0.19              |
| 52              | NR                  | 0.41            | 0.33            | 0.15             | 0.49            | 0.35            | 0.20            | 0.17             | 0.51            | 0.36             | 0.21             | 0.11              |
| 53              | NR                  | 0.50            | 0.30            | 0.16             | 0.82            | 0.20            | 0.20            | 0.12             | 0.50            | 0.30             | 0.16             | 0.09              |
| 54              | NR                  | 0.24            | 0.22            | 0.10             | 0.39            | 0.31            | 0.20            | 0.15             | 0.23            | 0.17             | 0.10             | 0.06              |
| 55              | NR                  | 0.27            | 0.27            | 0.12             | 0.19            | 0.12            | 0.09            | 0.05             | 1.40            | 0.83             | 0.44             | 0.17              |
| 56              | NR                  | 0.40            | 0.31            | 0.12             | 3.22            | 1.08            | 0.57            | 0.28             | 0.21            | 0.15             | 0.09             | 0.05              |
| 57              | NR                  | 0.30            | 0.22            | 0.09             | 0.46            | 0.30            | 0.22            | 0.12             | 0.51            | 0.37             | 0.19             | 0.10              |

TABLE 4-11. TEST 6 PRESSURE DATA (Continued)

| Event<br>Number | PEAK PRESSURE (psi) |                 |                 |                  |                 |                 |                 |                  |                 |                  |                  |                   |
|-----------------|---------------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|------------------|-----------------|------------------|------------------|-------------------|
|                 | POSITION NUMBER     |                 |                 |                  |                 |                 |                 |                  |                 |                  |                  |                   |
|                 | P1<br>(48.9 ft)     | P2<br>(69.1 ft) | P3<br>(98.3 ft) | P4<br>(199.3 ft) | P5<br>(49.6 ft) | P6<br>(69.9 ft) | P7<br>(99.2 ft) | P8<br>(199.5 ft) | P9<br>(48.9 ft) | P10<br>(68.7 ft) | P11<br>(98.9 ft) | P12<br>(198.6 ft) |
| 53              | NR                  | 0.18            | 0.21            | 0.09             | 1.80            | 1.15            | 0.68            | 0.38             | 0.26            | 0.19             | 0.12             | 0.08              |
| 59              | NR                  | 0.28            | 0.27            | 0.10             | 0.34            | 0.25            | 0.19            | 0.10             | 0.91            | 0.62             | 0.28             | 0.13              |
| 60              | NR                  | 0.51            | 0.34            | 0.14             | 0.28            | 0.23            | 0.14            | 0.06             | 0.36            | 0.31             | 0.20             | 0.10              |
| 61              | NR                  | 0.40            | 0.30            | 0.31             | 0.40            | 0.17            | 0.12            | 0.04             | 0.55            | 0.31             | 0.15             | 0.14              |
| 62              | NR                  | 0.49            | 0.31            | 0.12             | 1.25            | 0.87            | 0.39            | 0.19             | 0.33            | 0.26             | 0.16             | 0.11              |
| 63              | NR                  | 0.78            | 0.45            | 0.15             | 1.10            | 0.39            | 0.23            | 0.13             | 0.17            | 0.10             | 0.06             | 0.08              |
| 64              | NR                  | 0.12            | 0.14            | 0.08             | 0.60            | 0.39            | 0.24            | 0.09             | 0.88            | 0.52             | 0.22             | 0.11              |
| 65              | NR                  | 0.14            | 0.16            | 0.10             | 0.39            | 0.52            | 1.35            | 0.57             | 0.10            | 0.08             | 0.07             | 0.11              |
| 66              | NR                  | 0.31            | 0.26            | 0.12             | 1.96            | 0.86            | 0.47            | 0.46             | 0.62            | 0.49             | 0.20             | 0.10              |
| 67              | NR                  | 0.35            | 0.26            | 0.11             | 0.33            | 0.23            | 0.18            | 0.07             | 1.17            | 0.80             | 0.30             | 0.13              |
| 68              | NR                  | 0.20            | 0.21            | 0.10             | 0.42            | 0.29            | 0.23            | 0.09             | 0.39            | 0.35             | 0.25             | 0.09              |
| 69              | NR                  | 0.33            | 0.22            | 0.10             | 0.84            | 0.41            | 0.29            | 0.18             | 0.53            | 0.43             | 0.27             | 0.09              |
| 70              | NR                  | 0.24            | 0.20            | 0.10             | 0.38            | 0.29            | 0.20            | 0.12             | 0.43            | 0.33             | 0.20             | 0.09              |
| 71              | NR                  | 0.22            | 0.18            | 0.12             | 1.48            | 0.85            | 0.47            | 0.24             | 0.51            | 0.41             | 0.31             | 0.13              |
| 72              | NR                  | 0.24            | 0.20            | 0.06             | 1.00            | 0.61            | 0.85            | 0.18             | 0.21            | 0.17             | 0.12             | 0.06              |
| 73              | NR                  | 0.22            | 0.18            | 0.10             | NR              | 0.07            | 0.05            | 0.03             | 1.40            | 0.88             | 0.47             | 0.14              |
| 74              | NR                  | 0.14            | 0.15            | 0.08             | NR              | 0.31            | 0.16            | 0.09             | 1.38            | 0.89             | 0.52             | 0.16              |
| 75              | NR                  | 0.32            | 0.32            | 0.15             | NR              | 0.16            | 0.11            | 0.07             | 1.04            | 0.72             | 0.40             | 0.12              |
| 76              | NR                  | 0.25            | 0.22            | 0.12             | NR              | 1.29            | 0.55            | 0.17             | 0.22            | 0.17             | 0.13             | 0.06              |
| 77              | NR                  | 0.71            | 0.53            | 0.23             | NR              | 0.44            | 0.34            | 0.16             | 1.21            | 1.12             | 0.72             | 0.27              |
| 78              | NR                  | 0.33            | 0.28            | 0.13             | NR              | 0.78            | 0.38            | 0.20             | 0.28            | 0.23             | 0.22             | 0.10              |
| 79              | NR                  | 0.37            | 0.34            | 0.17             | NR              | 0.30            | 0.21            | 0.08             | 0.56            | 0.38             | 0.25             | 0.11              |
| 80              | NR                  | 0.55            | 0.39            | 0.15             | NR              | 0.13            | 0.13            | 0.08             | 0.12            | 0.15             | 0.13             | 0.05              |
| 81              | NR                  | 0.90            | 0.71            | 0.31             | 1.32            | 1.06            | 0.50            | 0.25             | 0.62            | 0.43             | 0.33             | 0.15              |
| 82              | NR                  | 0.40            | 0.38            | 0.15             | 0.35            | 0.24            | 0.19            | 0.11             | 0.56            | 0.54             | 0.30             | 0.14              |
| 83              | NR                  | 0.16            | 0.17            | 0.07             | 0.18            | 0.15            | 0.14            | 0.09             | 0.30            | 0.27             | 0.17             | 0.08              |
| 84              | NR                  | 0.40            | 0.31            | 0.14             | 1.20            | 1.02            | 0.70            | 0.35             | 0.13            | 0.10             | 0.07             | 0.05              |
| 85              | NR                  | 0.35            | 0.26            | 0.26             | 1.45            | 0.90            | 0.65            | 0.30             | 0.22            | 0.15             | 0.14             | 0.11              |
| 86              | NR                  | 0.11            | 0.15            | 0.08             | 0.27            | 0.21            | 0.15            | 0.09             | 0.80            | 0.65             | 0.36             | 0.14              |
| 87              | NR                  | 0.26            | 0.26            | 0.10             | 0.90            | 0.53            | 0.35            | 0.20             | 0.28            | 0.11             | 0.16             | 0.07              |
| 88              | NR                  | 0.26            | 0.20            | 0.10             | 1.80            | 0.85            | 0.69            | 0.37             | 0.29            | 0.18             | 0.18             | 0.08              |
| 89              | NR                  | 0.20            | 0.24            | 0.13             | 0.35            | 0.24            | 0.20            | 0.12             | 0.95            | 0.64             | 0.42             | 0.15              |
| 90              | NR                  | 0.33            | 0.37            | 0.18             | 0.11            | 0.19            | 0.13            | 0.07             | 1.95            | 1.11             | 0.69             | 0.22              |
| 91              | NR                  | 0.13            | 0.14            | 0.06             | 0.08            | 0.14            | 0.10            | 0.04             | 0.30            | 0.28             | 0.25             | 0.09              |
| 92              | NR                  | 0.13            | 0.12            | 0.06             | 0.10            | 0.10            | 0.07            | 0.02             | 0.26            | 0.15             | 0.15             | 0.11              |
| 93              | NR                  | 0.67            | 0.49            | 0.15             | 0.10            | 0.15            | 0.13            | 0.07             | 0.18            | 0.19             | 0.16             | 0.08              |
| 94              | NR                  | 0.35            | 0.28            | 0.15             | 0.08            | 0.14            | 0.12            | 0.09             | 0.25            | 0.16             | 0.12             | 0.11              |
| 95              | NR                  | 0.10            | 0.13            | 0.07             | 0.91            | 0.36            | 0.27            | 0.11             | 0.56            | 0.43             | 0.37             | 0.14              |
| 96              | NR                  | 0.16            | 0.16            | 0.10             | 2.15            | 1.53            | 0.56            | 0.22             | 0.42            | 0.47             | 0.17             | 0.15              |
| 97              | NR                  | 0.57            | 0.38            | 0.13             | 0.15            | 0.09            | 0.05            | 0.03             | 0.29            | 0.27             | 0.20             | 0.13              |
| 98              | NR                  | 0.25            | 0.20            | 0.14             | 0.16            | 0.07            | 0.06            | 0.03             | 0.29            | 0.32             | 0.28             | 0.17              |
| 99              | NR                  | 0.13            | 0.14            | 0.08             | 0.50            | 0.47            | 0.30            | 0.12             | 0.73            | 0.58             | 0.39             | 0.13              |
| 100             | NR                  | 0.20            | 0.21            | 0.09             | 0.20            | 0.12            | 0.08            | 0.05             | 0.52            | 0.42             | 0.29             | 0.12              |
| 101             | NR                  | 0.19            | 0.21            | 0.10             | 1.17            | 0.68            | 0.47            | 0.28             | 0.75            | 0.55             | 0.43             | 0.16              |
| 102             | NR                  | 0.63            | 0.42            | 0.13             | 0.57            | 0.43            | 0.31            | 0.17             | 0.21            | 0.20             | 0.16             | 0.10              |
| 103             | NR                  | 0.24            | 0.25            | 0.17             | 2.50            | 1.46            | 0.86            | 0.36             | 0.75            | 0.70             | 0.47             | 0.17              |
| 104             | NR                  | 0.31            | 0.31            | 0.18             | 1.51            | 1.70            | 0.63            | 0.24             | 0.89            | 0.75             | 0.50             | 0.16              |
| 105             | NR                  | 0.49            | 0.41            | 0.20             | 0.19            | 0.13            | 0.10            | 0.06             | 0.37            | 0.34             | 0.22             | 0.10              |
| 106             | NR                  | 0.98            | 0.60            | 0.25             | 0.63            | 0.39            | 0.27            | 0.13             | 2.05            | 1.25             | 0.74             | 0.23              |
| 107             | NR                  | 0.33            | 0.39            | 0.24             | 2.13            | 1.16            | 0.63            | 0.31             | 1.80            | 1.19             | 0.70             | 0.25              |
| 108             | NR                  | 0.12            | 0.19            | 0.11             | 0.80            | 0.65            | 0.29            | 0.11             | 0.78            | 0.59             | 0.36             | 0.12              |
| 109             | NR                  | 0.43            | 0.42            | 0.16             | 0.86            | 0.69            | 0.49            | 0.21             | 1.39            | 0.97             | 0.63             | 0.21              |
| 110             | NR                  | 0.20            | 0.20            | 0.10             | 0.87            | 0.64            | 0.45            | 0.23             | 0.33            | 0.25             | 0.18             | 0.10              |
| 111             | NR                  | 0.20            | 0.24            | 0.12             | 0.81            | 0.56            | 0.44            | 0.23             | 0.48            | 0.36             | 0.27             | 0.13              |
| 112             | NR                  | 0.15            | 0.16            | 0.11             | 0.81            | 0.52            | 0.65            | 0.44             | 0.66            | 0.66             | 0.45             | 0.17              |
| 113             | NR                  | 0.11            | 0.12            | 0.06             | 0.15            | 0.13            | 0.08            | 0.05             | 0.17            | 0.15             | 0.11             | 0.04              |
| 114             | NR                  | 0.22            | 0.23            | 0.04             | 0.25            | 0.15            | 0.11            | 0.06             | 0.30            | 0.20             | 0.16             | 0.10              |

TABLE 4-11. TEST 6 PRESSURE DATA (Continued)

| Event<br>Number | PEAK PRESSURE (psi) |                 |                 |                  |                 |                 |                 |                  |                 |                  |                  |                   |
|-----------------|---------------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|------------------|-----------------|------------------|------------------|-------------------|
|                 | POSITION NUMBER     |                 |                 |                  |                 |                 |                 |                  |                 |                  |                  |                   |
|                 | P1<br>(48.9 ft)     | P2<br>(69.1 ft) | P3<br>(98.3 ft) | P4<br>(199.3 ft) | P5<br>(49.6 ft) | P6<br>(69.9 ft) | P7<br>(99.2 ft) | P8<br>(199.5 ft) | P9<br>(48.9 ft) | P10<br>(68.7 ft) | P11<br>(98.9 ft) | P12<br>(198.6 ft) |
| 115             | NR                  | 0.09            | 0.12            | 0.06             | 0.60            | 0.36            | 0.29            | 0.14             | 0.81            | 0.59             | 0.39             | 0.13              |
| 116             | NR                  | 0.58            | 0.47            | 0.17             | 0.38            | 0.29            | 0.22            | 0.11             | 0.28            | 0.22             | 0.20             | 0.09              |
| 117             | NR                  | 0.14            | 0.21            | 0.14             | 0.39            | 0.30            | 0.28            | 0.09             | 1.06            | 0.77             | 0.43             | 0.13              |
| 118             | NR                  | 0.60            | 0.61            | 0.25             | 0.57            | 0.59            | 0.36            | 0.18             | 1.02            | 0.85             | 0.58             | 0.20              |
| 119             | NR                  | 0.82            | 0.53            | 0.20             | 0.34            | 0.42            | 0.14            | 0.09             | 0.75            | 0.72             | 0.35             | 0.19              |
| 120             | NR                  | 0.91            | 0.71            | 0.25             | 1.83            | 1.13            | 0.85            | 0.27             | 1.97            | 1.41             | 0.77             | 0.40              |
| 121             | NR                  | 0.15            | 0.18            | 0.10             | 1.16            | 0.72            | 0.44            | 0.26             | 0.85            | 0.53             | 0.23             | 0.14              |
| 122             | NR                  | 1.13            | 0.80            | 0.40             | 0.93            | 0.63            | 0.44            | 0.23             | 0.54            | 0.43             | 0.25             | 0.18              |
| 123             | NR                  | 0.40            | 0.31            | 0.14             | 0.69            | 0.46            | 0.25            | 0.14             | 0.35            | 0.27             | 0.13             | 0.11              |
| 124             | NR                  | 0.07            | 0.09            | 0.06             | 0.45            | 0.66            | 0.39            | 0.18             | 0.61            | 0.41             | 0.20             | 0.10              |
| 125             | NR                  | 0.14            | 0.16            | 0.08             | NR              | 0.11            | 0.09            | 0.03             | 1.37            | 0.97             | 0.30             | 0.14              |
| 126             | NR                  | 0.57            | 0.40            | 0.13             | 0.18            | 1.17            | 0.56            | 0.19             | 0.21            | 0.16             | 0.10             | 0.05              |
| 127             | NR                  | 0.12            | 0.11            | 0.06             | 0.49            | 0.45            | 0.27            | 0.12             | 0.43            | 0.40             | 0.14             | 0.12              |
| 128             | NR                  | 0.05            | 0.05            | 0.05             | 0.47            | 0.45            | 0.33            | 0.11             | 0.47            | 0.36             | 0.17             | 0.10              |
| 129             | NR                  | 0.06            | 0.08            | 0.06             | 0.63            | 0.60            | 0.45            | 0.22             | 0.92            | 0.52             | 0.29             | 0.19              |
| 130             | NR                  | 0.18            | 0.17            | 0.08             | 0.18            | 0.11            | 0.09            | 0.05             | 0.50            | 0.39             | 0.19             | 0.12              |
| 131             | NR                  | 0.21            | 0.20            | 0.09             | 0.74            | 0.87            | 0.31            | 0.14             | 0.12            | 0.09             | 0.06             | 0.04              |
| 132             | NR                  | 0.19            | 0.16            | 0.07             | 1.22            | 0.74            | 0.53            | 0.23             | 0.26            | 0.22             | 0.10             | 0.07              |
| 133             | NR                  | 0.18            | 0.26            | 0.11             | 0.23            | 0.16            | 0.11            | 0.05             | 1.94            | 1.07             | 0.40             | 0.16              |
| 134             | NR                  | 0.30            | 0.30            | 0.13             | 0.36            | 0.25            | 0.18            | 0.07             | 0.65            | 0.46             | 0.26             | 0.12              |
| 135             | NR                  | 0.15            | 0.15            | 0.06             | 0.10            | 0.05            | 0.03            | 0.02             | 0.28            | 0.26             | 0.14             | 0.10              |
| 136             | NR                  | 0.46            | 0.37            | 0.15             | 0.37            | 0.29            | 0.24            | 0.11             | 0.40            | 0.34             | 0.15             | 0.10              |
| 137             | NR                  | 0.14            | 0.14            | 0.13             | 0.48            | 0.13            | 0.09            | 0.06             | 0.55            | 0.21             | 0.13             | 0.12              |
| 138             | NR                  | 0.36            | 0.30            | 0.15             | 1.60            | 1.03            | 0.57            | 0.22             | 0.63            | 0.52             | 0.24             | 0.14              |
| 139             | NR                  | 0.50            | 0.34            | 0.14             | 0.97            | 0.52            | 0.58            | 0.23             | 0.48            | 0.43             | 0.22             | 0.12              |
| 140             | NR                  | 0.47            | 0.36            | 0.15             | 0.48            | 0.36            | 0.24            | 0.11             | 1.10            | 0.79             | 0.36             | 0.18              |
| 141             | NR                  | 0.77            | 0.62            | 0.30             | 0.85            | 0.94            | 0.59            | 0.20             | 1.71            | 1.24             | 0.56             | 0.25              |
| 142             | NR                  | 0.50            | 0.48            | 0.22             | 0.57            | 0.36            | 0.21            | 0.14             | 1.63            | 0.93             | 0.63             | 0.19              |
| 143             | NR                  | 0.73            | 0.53            | 0.23             | 0.65            | 0.76            | 0.25            | 0.11             | 1.34            | 1.06             | 0.81             | 0.30              |
| 144             | NR                  | 0.17            | 0.18            | 0.09             | 0.28            | 0.21            | 0.12            | 0.06             | 0.50            | 0.33             | 0.21             | 0.11              |
| 145             | NR                  | 0.05            | 0.07            | 0.01             | 0.25            | 0.14            | 0.09            | 0.06             | 1.01            | 0.86             | 0.42             | 0.14              |
| 146             | NR                  | 0.61            | 0.48            | 0.18             | 0.27            | 0.20            | 0.15            | 0.06             | 1.12            | 0.86             | 0.46             | 0.17              |
| 147             | NR                  | 0.44            | 0.34            | 0.13             | 1.00            | 0.72            | 0.57            | 0.27             | 0.31            | 0.20             | 0.16             | 0.08              |
| 148             | NR                  | 0.30            | 0.29            | 0.10             | 1.38            | 0.89            | 0.50            | 0.19             | 0.29            | 0.26             | 0.16             | 0.09              |
| 149             | NR                  | 0.18            | 0.17            | 0.08             | 0.21            | 0.13            | 0.09            | 0.05             | 0.31            | 0.24             | 0.16             | 0.08              |
| 150             | NR                  | 0.07            | 0.08            | 0.09             | 0.25            | 0.10            | 0.07            | 0.04             | 0.25            | 0.15             | 0.19             | 0.10              |
| 151             | NR                  | 0.20            | 0.16            | 0.08             | 0.31            | 0.19            | 0.11            | 0.07             | 0.64            | 0.43             | 0.26             | 0.10              |
| 152             | NR                  | 0.67            | 0.64            | 0.36             | 3.47            | 2.38            | 0.92            | 0.35             | 0.87            | 0.61             | 0.38             | 0.20              |
| 153             | NR                  | 0.41            | 0.36            | 0.15             | 1.61            | 1.49            | 0.72            | 0.22             | 0.25            | 0.20             | 0.18             | 0.10              |
| 154             | NR                  | 0.47            | 0.39            | 0.13             | 0.37            | 0.24            | 0.16            | 0.08             | 0.26            | 0.24             | 0.20             | 0.11              |
| 155             | NR                  | 0.44            | 0.29            | 0.12             | 1.20            | 0.83            | 0.43            | 0.19             | 0.27            | 0.22             | 0.16             | 0.07              |
| 156             | NR                  | 0.22            | 0.21            | 0.08             | 0.25            | 0.14            | 0.09            | 0.04             | 0.23            | 0.19             | 0.14             | 0.08              |
| 157             | NR                  | 0.15            | 0.18            | 0.07             | 0.22            | 0.14            | 0.10            | 0.05             | 0.82            | 0.53             | 0.33             | 0.14              |
| 158             | NR                  | 0.13            | 0.16            | 0.07             | 0.20            | 0.12            | 0.09            | 0.04             | 0.50            | 0.10             | 0.10             | 0.07              |
| 159             | NR                  | 0.23            | 0.30            | 0.10             | 1.18            | 0.69            | 0.48            | 0.22             | 0.39            | 0.35             | 0.23             | 0.10              |
| 160             | NR                  | 0.30            | 0.33            | 0.15             | 2.63            | 1.33            | 0.89            | 0.41             | 0.71            | 0.68             | 0.51             | 0.20              |
| 161             | NR                  | 0.16            | 0.18            | 0.10             | 1.40            | 0.74            | 0.41            | 0.29             | 0.28            | 0.25             | 0.18             | 0.08              |
| 162             | NR                  | 0.11            | 0.17            | 0.05             | 1.40            | 0.70            | 0.69            | 0.29             | 0.37            | 0.28             | 0.27             | 0.22              |
| 163             | NR                  | 0.29            | 0.21            | 0.08             | 1.92            | 1.10            | 0.78            | 0.29             | 0.73            | 0.56             | 0.38             | 0.16              |
| 164             | NR                  | 0.23            | 0.27            | 0.15             | 1.59            | 0.72            | 0.34            | 0.18             | 1.24            | 0.83             | 0.56             | 0.19              |
| 165             | NR                  | 0.42            | 0.36            | 0.15             | 0.54            | 0.24            | 0.18            | 0.10             | 0.43            | 0.32             | 0.23             | 0.10              |
| 166             | NR                  | 0.38            | 0.33            | 0.14             | 0.56            | 0.39            | 0.24            | 0.12             | 0.18            | 0.15             | 0.11             | 0.06              |
| 167             | NR                  | 0.37            | 0.32            | 0.11             | 0.43            | 0.15            | 0.14            | 0.04             | 0.14            | 0.10             | 0.10             | 0.06              |
| 168             | NR                  | 0.55            | 0.55            | 0.20             | 0.38            | 0.30            | 0.22            | 0.16             | 3.03            | 1.65             | 0.89             | 0.25              |
| 169             | NR                  | 0.60            | 0.52            | 0.20             | 1.01            | 1.00            | 0.60            | 0.26             | 1.07            | 0.79             | 0.56             | 0.24              |
| 170             | NR                  | 0.54            | 0.33            | 0.08             | 0.17            | 0.25            | 0.15            | 0.07             | 0.23            | 0.22             | 0.18             | 0.11              |
| 171             | NR                  | 0.32            | 0.25            | 0.06             | 0.89            | 0.33            | 0.15            | 0.08             | 0.32            | 0.28             | 0.21             | 0.09              |

TABLE 4-11. TEST 6 PRESSURE DATA (Continued)

| Event<br>Number | PEAK PRESSURE (psi) |                 |                 |                  |                 |                 |                 |                  |                 |                  |                  |                   |
|-----------------|---------------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|------------------|-----------------|------------------|------------------|-------------------|
|                 | POSITION NUMBER     |                 |                 |                  |                 |                 |                 |                  |                 |                  |                  |                   |
|                 | P1<br>(48.9 ft)     | P2<br>(69.1 ft) | P3<br>(98.3 ft) | P4<br>(199.3 ft) | P5<br>(49.6 ft) | P6<br>(69.9 ft) | P7<br>(99.2 ft) | P8<br>(199.5 ft) | P9<br>(48.9 ft) | P10<br>(68.7 ft) | P11<br>(98.9 ft) | P12<br>(198.6 ft) |
| 172             | NR                  | 0.07            | 0.05            | 0.04             | 0.25            | 0.17            | 0.12            | 0.05             | 0.17            | 0.14             | 0.10             | 0.05              |
| 173             | NR                  | 0.09            | 0.07            | 0.06             | 0.23            | 0.10            | 0.06            | 0.03             | 0.29            | 0.21             | 0.13             | 0.05              |
| 174             | NR                  | 0.10            | 0.13            | 0.05             | 0.18            | 0.10            | 0.06            | 0.03             | 1.13            | 0.68             | 0.43             | 0.12              |
| 175             | NR                  | 0.60            | 0.55            | 0.25             | 0.69            | 0.55            | 0.34            | 0.14             | 1.50            | 1.14             | 0.75             | 0.25              |
| 176             | NR                  | 0.51            | 0.60            | 0.20             | 1.28            | 1.21            | 1.17            | 0.46             | 0.73            | 0.50             | 0.34             | 0.14              |
| 177             | NR                  | 0.32            | 0.27            | 0.17             | 0.38            | 0.27            | 0.18            | 0.09             | 0.61            | 0.46             | 0.26             | 0.11              |
| 178             | NR                  | 0.21            | 0.22            | 0.10             | 0.18            | 0.12            | 0.08            | 0.05             | 0.47            | 0.35             | 0.24             | 0.10              |
| 179             | NR                  | 0.17            | 0.20            | 0.12             | 1.96            | 0.89            | 0.46            | 0.19             | 0.29            | 0.30             | 0.22             | 0.10              |
| 180             | NR                  | 0.18            | 0.20            | 0.10             | 1.73            | 0.78            | 0.57            | 0.16             | 0.55            | 0.43             | 0.29             | 0.10              |
| 181             | NR                  | 0.05            | 0.10            | 0.01             | 0.91            | 0.51            | 0.33            | 0.27             | 0.74            | 0.48             | 0.25             | 0.08              |
| 182             | NR                  | 0.57            | 0.37            | 0.04             | 0.56            | 0.29            | 0.19            | 0.07             | 0.12            | 0.11             | 0.08             | 0.08              |
| 183             | NR                  | 0.19            | 0.22            | 0.09             | 0.29            | 0.23            | 0.12            | 0.06             | 0.96            | 0.74             | 0.48             | 0.16              |
| 184             | NR                  | 1.07            | 0.74            | 0.23             | 0.32            | 0.20            | 0.15            | 0.07             | 0.71            | 0.70             | 0.41             | 0.20              |
| 185             | NR                  | 0.22            | 0.22            | 0.11             | 0.30            | 0.19            | 0.11            | 0.05             | 1.00            | 0.66             | 0.47             | 0.16              |
| 186             | NR                  | 0.73            | 0.46            | 0.15             | 1.10            | 0.83            | 0.62            | 0.27             | 0.16            | 0.13             | 0.09             | 0.05              |
| 187             | NR                  | 0.68            | 0.47            | 0.14             | 0.53            | 0.30            | 0.21            | 0.11             | 0.55            | 0.48             | 0.34             | 0.17              |
| 188             | NR                  | 0.46            | 0.42            | 0.18             | 0.61            | 0.44            | 0.37            | 0.20             | 3.37            | 1.70             | 0.93             | 0.26              |
| 189             | NR                  | 0.51            | 0.38            | 0.14             | 0.62            | 0.45            | 0.39            | 0.22             | 0.36            | 0.32             | 0.21             | 0.10              |
| 190             | NR                  | 0.19            | 0.18            | 0.07             | 0.15            | 0.11            | 0.06            | 0.03             | 0.29            | 0.19             | 0.14             | 0.05              |
| 191             | NR                  | 0.22            | 0.22            | 0.08             | 0.71            | 0.34            | 0.34            | 0.14             | 0.84            | 0.56             | 0.37             | 0.13              |
| 192             | NR                  | 1.16            | 0.82            | 0.40             | 1.24            | 0.70            | 0.56            | 0.32             | 0.67            | 0.61             | 0.47             | 0.23              |
| 193             | NR                  | 0.35            | 0.36            | 0.16             | 0.48            | 0.37            | 0.27            | 0.17             | 1.34            | 0.95             | 0.62             | 0.20              |
| 194             | NR                  | 0.48            | 0.43            | 0.20             | 1.86            | 0.99            | 0.75            | 0.39             | 0.62            | 0.43             | 0.30             | 0.16              |
| 195             | NR                  | 0.32            | 0.30            | 0.12             | 0.13            | 0.12            | 0.13            | 0.08             | 2.95            | 1.68             | 0.84             | 0.23              |
| 196             | NR                  | 0.28            | 0.27            | 0.10             | 0.98            | 0.58            | 0.44            | 0.20             | 0.17            | 0.15             | 0.11             | 0.05              |
| 197             | NR                  | 0.45            | 0.39            | 0.16             | 0.20            | 0.16            | 0.13            | 0.07             | 1.50            | 0.82             | 0.52             | 0.17              |
| 198             | NR                  | 0.62            | 0.47            | 0.20             | 0.26            | 0.18            | 0.13            | 0.08             | 0.64            | 0.59             | 0.39             | 0.13              |
| 199             | NR                  | 1.41            | 0.83            | 0.22             | 0.73            | 0.46            | 0.30            | 0.20             | 1.27            | 0.65             | 0.45             | 0.18              |
| 200             | NR                  | 0.52            | 0.44            | 0.20             | 0.62            | 0.29            | 0.23            | 0.10             | 1.27            | 0.86             | 0.62             | 0.21              |
| 201             | NR                  | 0.16            | 0.17            | 0.07             | 0.51            | 0.38            | 0.24            | 0.10             | 0.77            | 0.52             | 0.33             | 0.12              |
| 202             | NR                  | 0.12            | 0.16            | 0.10             | 2.31            | 0.96            | 0.43            | 0.20             | 0.98            | 0.65             | 0.44             | 0.16              |
| 203             | NR                  | 0.60            | 0.42            | 0.10             | 1.21            | 0.99            | 0.52            | 0.23             | 0.48            | 0.26             | 0.20             | 0.18              |
| 204             | NR                  | 0.99            | 0.73            | 0.24             | 0.25            | 0.17            | 0.14            | 0.06             | 1.00            | 0.79             | 0.44             | 0.17              |
| 205             | NR                  | 0.44            | 0.34            | 0.14             | 1.54            | 1.01            | 0.69            | 0.21             | 0.47            | 0.34             | 0.25             | 0.11              |
| 206             | NR                  | 0.70            | 0.47            | 0.17             | 0.99            | 0.60            | 0.33            | 0.18             | 0.35            | 0.23             | 0.17             | 0.10              |
| 207             | NR                  | 0.31            | 0.40            | 0.23             | 0.43            | 0.27            | 0.20            | 0.11             | 1.23            | 0.86             | 0.51             | 0.19              |
| 208             | NR                  | 0.68            | 0.51            | 0.23             | 0.40            | 0.20            | 0.14            | 0.08             | 1.06            | 0.65             | 0.32             | 0.12              |
| 209             | NR                  | 0.10            | 0.13            | 0.07             | 0.35            | 0.60            | 0.33            | 0.14             | 0.69            | 0.50             | 0.30             | 0.14              |
| 210             | NR                  | 0.88            | 0.58            | 0.24             | 2.32            | 1.23            | 0.62            | 0.30             | 0.66            | 0.94             | 0.47             | 0.25              |
| 211             | NR                  | 1.27            | 0.89            | 0.25             | 0.44            | 0.28            | 0.22            | 0.15             | 1.19            | 0.88             | 0.48             | 0.20              |
| 212             | NR                  | 0.17            | 0.29            | 0.17             | 1.94            | 1.11            | 0.61            | 0.22             | 1.33            | 0.97             | 0.58             | 0.24              |
| 213             | NR                  | 0.58            | 0.48            | 0.17             | 0.55            | 0.46            | 0.30            | 0.14             | 0.70            | 0.55             | 0.39             | 0.20              |
| 214             | NR                  | 0.50            | 0.32            | 0.12             | 1.82            | 1.12            | 0.67            | 0.28             | 1.41            | 0.90             | 0.51             | 0.19              |
| 215             | NR                  | 0.45            | 0.32            | 0.11             | 1.12            | 0.52            | 0.29            | 0.13             | 0.49            | 0.40             | 0.30             | 0.13              |
| 216             | NR                  | 1.13            | 0.72            | 0.22             | 0.98            | 1.12            | 0.91            | 0.42             | 1.06            | 0.89             | 0.51             | 0.29              |
| 217             | NR                  | 0.72            | 0.58            | 0.21             | 0.67            | 0.36            | 0.24            | 0.14             | 0.95            | 0.86             | 0.57             | 0.19              |
| 218             | NR                  | 0.49            | 0.39            | 0.19             | 0.52            | 0.24            | 0.17            | 0.09             | 0.65            | 0.52             | 0.36             | 0.12              |
| 219             | NR                  | 0.29            | 0.17            | 0.29             | 0.55            | 0.16            | 0.18            | 0.14             | 0.40            | 0.27             | 0.29             | 0.11              |
| 220             | NR                  | 0.46            | 0.40            | 0.13             | 0.46            | 0.24            | 0.17            | 0.09             | 0.34            | 0.26             | 0.19             | 0.08              |
| 221             | NR                  | 0.48            | 0.38            | 0.13             | 0.48            | 0.27            | 0.19            | 0.11             | 0.42            | 0.25             | 0.16             | 0.10              |
| 222             | NR                  | 0.59            | 0.49            | 0.17             | NR              | 2.90            | 1.28            | 0.35             | 0.30            | 0.29             | 0.24             | 0.15              |
| 223             | NR                  | 0.97            | 0.78            | 0.27             | 1.45            | 0.60            | 0.41            | 0.15             | 1.32            | 1.14             | 0.74             | 0.25              |
| 224             | NR                  | 0.45            | 0.29            | 0.10             | 0.20            | 0.17            | 0.14            | 0.07             | 0.17            | 0.16             | 0.11             | 0.06              |
| 225             | NR                  | 0.24            | 0.30            | 0.13             | 2.53            | 1.23            | 0.46            | 0.20             | 0.52            | 0.50             | 0.24             | 0.11              |
| 226             | NR                  | 0.10            | 0.12            | 0.13             | 2.00            | 1.20            | 0.64            | 0.25             | 0.62            | 0.30             | 0.25             | 0.14              |
| 227             | NR                  | 0.56            | 0.39            | 0.13             | 0.18            | 0.12            | 0.09            | 0.06             | 0.60            | 0.53             | 0.30             | 0.15              |
| 228             | NR                  | 0.42            | 0.34            | 0.13             | 0.19            | 0.07            | 0.06            | 0.04             | 0.57            | 0.26             | 0.23             | 0.13              |

TABLE 4-11. TEST 6 PRESSURE DATA (Continued)

| Event<br>Number | PEAK PRESSURE (psi) |                 |                 |                  |                 |                 |                 |                  |                 |                  |                  |                   |
|-----------------|---------------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|------------------|-----------------|------------------|------------------|-------------------|
|                 | POSITION NUMBER     |                 |                 |                  |                 |                 |                 |                  |                 |                  |                  |                   |
|                 | P1<br>(48.9 ft)     | P2<br>(69.1 ft) | P3<br>(98.3 ft) | P4<br>(199.3 ft) | P5<br>(49.6 ft) | P6<br>(69.9 ft) | P7<br>(99.2 ft) | P8<br>(199.5 ft) | P9<br>(48.9 ft) | P10<br>(68.7 ft) | P11<br>(98.9 ft) | P12<br>(198.6 ft) |
| 229             | NR                  | 0.29            | 0.29            | 0.17             | 1.23            | 0.88            | 0.74            | 0.31             | 2.95            | 1.62             | 0.92             | 0.28              |
| 230             | NR                  | 0.65            | 0.56            | 0.17             | 0.47            | 0.42            | 0.22            | 0.09             | 0.45            | 0.41             | 0.29             | 0.10              |
| 231             | NR                  | 0.53            | 0.45            | 0.15             | 3.31            | 1.17            | 0.67            | 0.22             | 0.48            | 0.40             | 0.30             | 0.15              |
| 232             | NR                  | 0.22            | 0.20            | 0.09             | 0.28            | 0.19            | 0.11            | 0.05             | 0.55            | 0.48             | 0.35             | 0.10              |
| 233             | NR                  | 0.09            | 0.13            | 0.07             | 0.52            | 0.40            | 0.29            | 0.18             | 1.07            | 1.00             | 0.68             | 0.28              |
| 234             | NR                  | NR              | NR              | NR               | 1.10            | 0.37            | 0.20            | 0.15             | 1.36            | 0.87             | 0.60             | 0.27              |
| 235             | NR                  | 0.31            | 0.34            | 0.18             | 1.46            | 0.80            | 0.50            | 0.25             | 1.01            | 0.87             | 0.44             | 0.16              |
| 236             | NR                  | 0.48            | 0.42            | 0.17             | 1.04            | 0.65            | 0.45            | 0.19             | 0.44            | 0.41             | 0.26             | 0.12              |
| 237             | NR                  | 0.74            | 0.75            | 0.29             | 0.95            | 0.44            | 0.36            | 0.24             | 0.43            | 0.38             | 0.28             | 0.15              |
| 238             | NR                  | 0.40            | 0.18            | 0.29             | 0.72            | 0.31            | 0.31            | 0.10             | 0.26            | 0.24             | 0.19             | 0.10              |
| 239             | NR                  | 0.95            | 0.59            | 0.20             | 1.23            | 0.60            | 0.42            | 0.22             | 0.40            | 0.30             | 0.22             | 0.12              |
| 240             | NR                  | 0.98            | 0.62            | 0.20             | 2.25            | 1.07            | 0.54            | 0.27             | 1.02            | 0.74             | 0.49             | 0.17              |
| 241             | NR                  | 0.20            | 0.16            | 0.07             | 0.48            | 0.33            | 0.18            | 0.08             | 0.29            | 0.32             | 0.17             | 0.09              |
| 242             | NR                  | 0.86            | 0.63            | 0.23             | 2.05            | 1.22            | 0.82            | 0.33             | 0.78            | 0.69             | 0.45             | 0.17              |
| 243             | NR                  | 0.36            | 0.31            | 0.15             | 0.27            | 0.13            | 0.08            | 0.05             | 0.72            | 0.51             | 0.36             | 0.10              |
| 244             | NR                  | 0.26            | 0.25            | 0.12             | 0.32            | 0.15            | 0.09            | 0.05             | 1.12            | 0.84             | 0.47             | 0.14              |
| 245             | NR                  | 1.11            | 0.75            | 0.20             | 0.68            | 0.51            | 0.35            | 0.10             | 0.77            | 0.79             | 0.51             | 0.25              |
| 246             | NR                  | 0.15            | 0.15            | 0.07             | 0.25            | 0.21            | 0.15            | 0.08             | 0.40            | 0.34             | 0.21             | 0.10              |
| 247             | NR                  | 0.40            | 0.31            | 0.13             | 0.63            | 0.26            | 0.23            | 0.10             | 0.50            | 0.46             | 0.30             | 0.14              |
| 248             | NR                  | 0.75            | 0.51            | 0.11             | 0.63            | 0.29            | 0.22            | 0.14             | 0.46            | 0.30             | 0.26             | 0.15              |
| 249             | NR                  | 0.79            | 0.55            | 0.18             | 2.30            | 1.49            | 0.73            | 0.21             | 0.55            | 0.40             | 0.33             | 0.16              |
| 250             | NR                  | 0.46            | 0.38            | 0.20             | 0.59            | 0.39            | 0.28            | 0.18             | 2.40            | 1.34             | 0.74             | 0.24              |
| 251             | NR                  | 0.35            | 0.31            | 0.10             | 2.09            | 1.02            | 0.35            | 0.17             | 0.33            | 0.30             | 0.17             | 0.08              |
| 252             | NR                  | 0.11            | 0.15            | 0.08             | 0.60            | 0.40            | 0.20            | 0.12             | 0.21            | 0.24             | 0.21             | 0.10              |
| 253             | NR                  | 0.45            | 0.40            | 0.22             | 1.12            | 0.76            | 0.57            | 0.30             | 2.23            | 1.40             | 0.88             | 0.32              |
| 254             | NR                  | 0.27            | 0.28            | 0.12             | 0.76            | 0.54            | 0.41            | 0.22             | 2.08            | 1.16             | 0.75             | 0.21              |
| 255             | NR                  | 1.11            | 0.75            | 0.22             | 1.64            | 1.07            | 0.56            | 0.29             | 0.71            | 0.67             | 0.53             | 0.20              |
| 256             | NR                  | 0.45            | 0.43            | 0.20             | 2.19            | 1.21            | 0.75            | 0.26             | 0.83            | 0.74             | 0.52             | 0.22              |
| 257             | NR                  | 0.49            | 0.38            | 0.17             | 0.32            | 0.21            | 0.15            | 0.07             | 0.96            | 0.70             | 0.48             | 0.14              |
| 258             | NR                  | 0.16            | 0.11            | 0.05             | 0.12            | 0.09            | 0.07            | 0.03             | 0.06            | 0.04             | 0.03             | 0.02              |
| 259             | NR                  | 0.41            | 0.40            | 0.15             | 1.95            | 1.31            | 0.72            | 0.35             | 1.16            | 0.82             | 0.51             | 0.19              |
| 260             | NR                  | 1.25            | 0.76            | 0.22             | 1.23            | 0.84            | 0.52            | 0.24             | 0.37            | 0.27             | 0.22             | 0.12              |
| 261             | NR                  | 0.45            | 0.37            | 0.13             | 1.62            | 1.15            | 0.53            | 0.22             | 0.23            | 0.21             | 0.13             | 0.07              |
| 262             | NR                  | 0.23            | 0.23            | 0.10             | 0.31            | 0.36            | 0.19            | 0.10             | 0.52            | 0.40             | 0.24             | 0.09              |
| 263             | NR                  | 0.17            | 0.14            | 0.10             | NR              | 0.18            | 0.05            | 0.02             | 0.40            | 0.20             | 0.10             | 0.08              |
| 264             | NR                  | 0.59            | 0.42            | 0.15             | 1.18            | 0.69            | 0.36            | 0.20             | 0.50            | 0.35             | 0.29             | 0.12              |
| 265             | NR                  | 0.31            | 0.30            | 0.11             | 0.92            | 0.60            | 0.33            | 0.16             | 0.89            | 0.64             | 0.43             | 0.16              |
| 266             | NR                  | 0.63            | 0.49            | 0.16             | 0.74            | 0.54            | 0.38            | 0.19             | 0.60            | 0.53             | 0.39             | 0.14              |
| 267             | NR                  | 0.95            | 0.77            | 0.29             | 1.15            | 0.69            | 0.48            | 0.22             | 2.09            | 1.54             | 0.94             | 0.26              |
| 268             | NR                  | 0.84            | 0.56            | 0.19             | 3.60            | 1.47            | 0.68            | 0.27             | 0.24            | 0.26             | 0.19             | 0.10              |
| 269             | NR                  | 0.81            | 0.61            | 0.18             | 0.74            | 0.45            | 0.30            | 0.16             | 0.69            | 0.65             | 0.43             | 0.16              |
| 270             | NR                  | 0.18            | 0.18            | 0.06             | 1.18            | 0.69            | 0.38            | 0.19             | 0.61            | 0.53             | 0.34             | 0.11              |
| 271             | NR                  | 0.77            | 0.55            | 0.21             | 0.59            | 0.38            | 0.27            | 0.15             | 1.15            | 0.83             | 0.53             | 0.18              |
| 272             | NR                  | 0.97            | 0.73            | 0.28             | 0.49            | 0.37            | 0.26            | 0.15             | 2.77            | 1.81             | 0.65             | 0.30              |
| 273             | NR                  | 0.69            | 0.53            | 0.23             | 0.75            | 0.58            | 0.39            | 0.17             | 1.69            | 1.17             | 0.65             | 0.21              |
| 274             | NR                  | 0.43            | 0.34            | 0.13             | 1.03            | 0.80            | 0.42            | 0.16             | 0.55            | 0.48             | 0.51             | 0.13              |
| 275             | NR                  | 0.94            | 0.64            | 0.29             | 1.57            | 1.03            | 0.52            | 0.22             | 0.94            | 0.79             | 0.46             | 0.19              |
| 276             | NR                  | 1.07            | 0.88            | 0.26             | 0.80            | 0.53            | 0.30            | 0.18             | 1.16            | 0.86             | 0.55             | 0.18              |
| 277             | NR                  | 0.91            | 0.64            | 0.16             | 1.06            | 0.56            | 0.37            | 0.16             | 0.56            | 0.56             | 0.41             | 0.17              |
| 278             | NR                  | 0.51            | 0.46            | 0.20             | 1.86            | 0.93            | 0.54            | 0.23             | 1.41            | 0.94             | 0.77             | 0.20              |
| 279             | NR                  | 0.22            | 0.17            | 0.08             | 0.26            | 0.18            | 0.13            | 0.06             | 0.63            | 0.48             | 0.30             | 0.13              |
| 280             | NR                  | 0.41            | 0.32            | 0.12             | 0.30            | 0.07            | 0.05            | 0.03             | 0.90            | 0.69             | 0.40             | 0.14              |
| 281             | NR                  | 0.99            | 0.60            | 0.10             | 1.99            | 1.03            | 0.58            | 0.30             | 0.27            | 0.19             | 0.16             | 0.13              |
| 282             | NR                  | 0.04            | 0.04            | 0.01             | 0.16            | 0.09            | 0.06            | 0.03             | 0.06            | 0.04             | 0.03             | 0.01              |
| 283             | NR                  | 0.62            | 0.49            | 0.19             | 1.06            | 0.81            | 0.37            | 0.20             | 1.21            | 0.96             | 0.56             | 0.19              |
| 284             | NR                  | 0.18            | 0.16            | 0.07             | 0.59            | 0.41            | 0.30            | 0.12             | 0.40            | 0.34             | 0.20             | 0.10              |
| 285             | NR                  | 0.10            | 0.14            | 0.07             | 0.52            | 0.17            | 0.13            | 0.05             | 0.36            | 0.25             | 0.17             | 0.12              |

TABLE 4-11. TEST 6 PRESSURE DATA (Continued)

| Event<br>Number | PEAK PRESSURE (psi) |                 |                 |                  |                 |                 |                 |                  |                 |                  |                  |                   |
|-----------------|---------------------|-----------------|-----------------|------------------|-----------------|-----------------|-----------------|------------------|-----------------|------------------|------------------|-------------------|
|                 | POSITION NUMBER     |                 |                 |                  |                 |                 |                 |                  |                 |                  |                  |                   |
|                 | P1<br>(48.9 ft)     | P2<br>(69.1 ft) | P3<br>(98.3 ft) | P4<br>(199.3 ft) | P5<br>(49.6 ft) | P6<br>(69.9 ft) | P7<br>(99.2 ft) | P8<br>(199.5 ft) | P9<br>(48.9 ft) | P10<br>(68.7 ft) | P11<br>(98.9 ft) | P12<br>(198.6 ft) |
| 286             | NR                  | 0.98            | 0.68            | 0.23             | 0.51            | 0.44            | 0.37            | 0.16             | 1.19            | 0.89             | 0.56             | 0.19              |
| 287             | NR                  | 0.51            | 0.38            | 0.17             | 0.63            | 0.44            | 0.31            | 0.16             | 0.57            | 0.47             | 0.26             | 0.12              |
| 288             | NR                  | 0.85            | 0.61            | 0.21             | 1.22            | 0.78            | 0.32            | 0.18             | 1.20            | 0.88             | 0.51             | 0.20              |
| 289             | NR                  | 0.48            | 0.41            | 0.18             | 0.41            | 0.38            | 0.35            | 0.23             | NR              | 3.14             | 1.20             | 0.31              |
| 290             | NR                  | 0.39            | 0.33            | 0.14             | 2.18            | 0.89            | 0.56            | 0.31             | 0.73            | 0.59             | 0.41             | 0.14              |
| 291             | NR                  | 0.92            | 0.65            | 0.24             | 0.71            | 0.67            | 0.47            | 0.24             | 1.10            | 0.87             | 0.82             | 0.16              |
| 292             | NR                  | 0.92            | 0.62            | 0.22             | 1.74            | 0.84            | 0.51            | 0.22             | 0.87            | 0.82             | 0.57             | 0.19              |
| 293             | NR                  | 0.65            | 0.53            | 0.16             | 1.52            | 0.62            | 0.43            | 0.17             | 1.05            | 0.83             | 0.54             | 0.21              |
| 294             | NR                  | 0.51            | 0.42            | 0.22             | 0.73            | 0.51            | 0.31            | 0.16             | 2.04            | 1.20             | 0.65             | 0.18              |
| 295             | NR                  | 0.31            | 0.29            | 0.24             | 0.17            | 0.11            | 0.07            | 0.03             | 1.00            | 0.73             | 0.36             | 0.13              |
| 296             | NR                  | 1.09            | 0.75            | 0.22             | 1.52            | 1.13            | 0.65            | 0.31             | 0.88            | 0.82             | 0.55             | 0.19              |
| 297             | NR                  | 0.93            | 0.63            | 0.20             | 0.56            | 0.35            | 0.27            | 0.12             | 0.93            | 0.78             | 0.43             | 0.17              |
| 298             | NR                  | 0.30            | 0.30            | 0.21             | 0.53            | 0.25            | 0.20            | 0.15             | 1.12            | 0.61             | 0.45             | 0.25              |
| 299             | NR                  | 0.62            | 0.45            | 0.17             | 3.24            | 1.35            | 0.83            | 0.32             | 0.56            | 0.48             | 0.34             | 0.18              |
| 300             | NR                  | 0.88            | 0.59            | 0.21             | 1.16            | 0.66            | 0.42            | 0.22             | 1.21            | 0.87             | 0.56             | 0.20              |
| 301             | NR                  | 0.74            | 0.50            | 0.15             | 1.33            | 0.76            | 0.45            | 0.19             | 0.83            | 0.70             | 0.46             | 0.17              |
| 302             | NR                  | 0.43            | 0.37            | 0.18             | 2.12            | 1.07            | 0.66            | 0.36             | 2.03            | 1.30             | 0.77             | 0.22              |
| 303             | NR                  | 0.88            | 0.64            | 0.21             | 1.27            | 1.05            | 0.47            | 0.17             | 1.64            | 1.09             | 0.59             | 0.23              |
| 304             | NR                  | 0.71            | 0.56            | 0.22             | 1.05            | 0.52            | 0.35            | 0.17             | 1.65            | 1.10             | 0.65             | 0.18              |
| 305             | NR                  | 1.40            | 0.89            | 0.25             | 1.98            | 1.10            | 0.71            | 0.34             | 1.27            | 0.98             | 0.60             | 0.22              |
| 306             | NR                  | 1.30            | 0.80            | 0.21             | 1.00            | 0.65            | 0.48            | 0.27             | 0.85            | 0.70             | 0.53             | 0.20              |
| 307             | NR                  | 0.49            | 0.39            | 0.16             | 1.18            | 0.65            | 0.45            | 0.29             | 1.26            | 0.79             | 0.41             | 0.14              |
| 308             | NR                  | 0.22            | 0.20            | 0.16             | NR              | NR              | NR              | NR               | 1.50            | 0.61             | 0.47             | 0.17              |
| 309             | NR                  | 1.42            | 0.84            | 0.18             | 0.89            | 0.80            | 0.52            | 0.22             | 0.93            | 0.44             | 0.27             | 0.13              |
| 310             | NR                  | 0.32            | 0.29            | 0.12             | 1.31            | 0.64            | 0.39            | 0.21             | 0.80            | 0.52             | 0.30             | 0.11              |
| 311             | NR                  | 0.66            | 0.53            | 0.22             | 0.60            | 0.45            | 0.28            | 0.14             | 2.29            | 1.22             | 0.60             | 0.21              |
| 312             | NR                  | 0.69            | 0.55            | 0.21             | 1.71            | 0.96            | 0.57            | 0.22             | 1.73            | 0.82             | 0.49             | 0.18              |
| 313             | NR                  | 1.25            | 0.81            | 0.23             | 1.48            | 1.01            | 0.53            | 0.30             | 1.68            | 1.09             | 0.71             | 0.24              |
| 314             | NR                  | 0.68            | 0.48            | 0.17             | 0.74            | 0.47            | 0.35            | 0.16             | 0.90            | 0.70             | 0.38             | 0.16              |
| 315             | NR                  | 0.79            | 0.50            | 0.20             | 3.06            | 1.20            | 0.68            | 0.26             | 0.81            | 0.64             | 0.45             | 0.19              |
| 316             | NR                  | 0.68            | 0.51            | 0.19             | 0.33            | 0.27            | 0.22            | 0.13             | 1.69            | 1.07             | 0.61             | 0.19              |
| 317             | NR                  | 1.02            | 0.68            | 0.23             | 0.80            | 0.60            | 0.40            | 0.26             | 1.04            | 0.79             | 0.50             | 0.20              |
| 318             | NR                  | 0.87            | 0.63            | 0.25             | 1.07            | 0.66            | 0.46            | 0.20             | 1.80            | 1.18             | 0.70             | 0.20              |
| 319             | NR                  | 0.82            | 0.61            | 0.23             | 1.44            | 0.89            | 0.57            | 0.26             | 2.44            | 1.64             | 0.93             | 0.27              |
| 320             | NR                  | 0.73            | 0.57            | 0.19             | 1.73            | 0.98            | 0.55            | 0.25             | 1.36            | 0.88             | 0.58             | 0.19              |
| 321             | NR                  | 0.83            | 0.64            | 0.23             | 0.90            | 0.58            | 0.46            | 0.27             | 2.20            | 1.24             | 0.68             | 0.22              |
| 322             | NR                  | 0.97            | 0.67            | 0.20             | 2.53            | 1.28            | 0.76            | 0.28             | 0.92            | 0.70             | 0.50             | 0.22              |
| 323             | NR                  | 1.08            | 0.77            | 0.23             | 1.57            | 1.04            | 0.65            | 0.27             | 0.94            | 0.74             | 0.49             | 0.17              |
| 324             | NR                  | 1.24            | 0.87            | 0.25             | 2.31            | 1.17            | 0.67            | 0.24             | 1.15            | 0.94             | 0.62             | 0.20              |

NR: no useable record

TABLE 4-12. TEST 6 TIME OF ARRIVAL DATA

| EVENT<br>NUMBER | TIME OF ARRIVAL (ms) |                 |                 |                  |                       |                 |                 |                  |                 |                  |                  |                   |
|-----------------|----------------------|-----------------|-----------------|------------------|-----------------------|-----------------|-----------------|------------------|-----------------|------------------|------------------|-------------------|
|                 | POSITION NUMBER      |                 |                 |                  |                       |                 |                 |                  |                 |                  |                  |                   |
|                 | P1<br>(48.9 ft)      | P2<br>(69.1 ft) | P3<br>(98.3 ft) | P4<br>(199.3 ft) | P5<br>(49.6 ft)       | P6<br>(69.9 ft) | P7<br>(99.2 ft) | P8<br>(199.5 ft) | P9<br>(48.9 ft) | P10<br>(68.7 ft) | P11<br>(98.9 ft) | P12<br>(198.6 ft) |
| 1               | 32.40                | 45.50           | 72.50           | 162.2            | 29.90                 | 47.10           | 72.80           | 162.2            | 29.30           | 47.10            | 73.50            | 163.5             |
| 2               | 34.56                | 50.93           | 77.70           | 167.0            | 37.80                 | 54.41           | 79.59           | 165.4            | 34.18           | 51.79            | 78.38            | 167.3             |
| 3               | 37.40                | 54.44           | 80.81           | 169.8            | 29.81                 | 46.60           | 72.00           | 160.0            | 39.08           | 56.41            | 82.87            | 165.4             |
| 4               |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 5               | 33.52                | 49.63           | 75.83           | 166.6            | 34.01                 | 50.09           | 74.50           | 165.4            | 28.29           | 45.91            | 72.50            | 161.6             |
| 6               | 31.80                | 49.20           | 76.08           | 158.4            | 24.06                 | 40.64           | 65.51           | 152.7            | 28.45           | 46.15            | 72.99            | 162.2             |
| 7               | 32.18                | 49.08           | 75.05           | 159.0            | 22.30                 | 36.83           | 62.26           | 149.2            | 31.71           | 49.28            | 76.87            | 165.4             |
| 8               | 25.71                | 40.39           | 66.59           | 156.5            | 27.46                 | 42.18           | 66.78           | 154.0            | 25.35           | 43.13            | 69.89            | 159.0             |
| 9               | 32.08                | 49.46           | 75.55           | 165.4            | 26.70                 | 42.66           | 66.41           | 153.0            | 42.63           | 60.56            | 87.31            | 177.5             |
| 10              | 35.85                | 51.89           | 77.56           | 167.3            | 31.20                 | 48.63           | 74.42           | 160.9            | 25.95           | 43.63            | 70.38            | 159.6             |
| 11              | 35.00                | 51.50           | 77.60           | 168.6            | 32.04                 | 49.19           | 76.30           | 164.7            | 28.60           | 45.80            | 73.10            | 162.2             |
| 12              | 36.25                | 53.96           | 79.29           | 169.2            | 25.98                 | 42.35           | 67.17           | 154.5            | 34.76           | 52.52            | 79.66            | 169.2             |
| 13              | 28.23                | 45.89           | 72.42           | 162.2            | NR                    | 46.28           | 71.18           | 158.4            | 32.12           | 49.80            | 77.33            | 166.6             |
| 14              | 34.30                | 51.14           | 77.50           | 167.3            | NR                    | 53.08           | 78.22           | 165.4            | 33.46           | 51.04            | 77.55            | 166.6             |
| 15              | 30.60                | 48.40           | 74.50           | 177.0            | 23.60                 | 40.20           | 65.60           | 151.9            | 42.10           | 62.40            | 91.10            | 172.9             |
| 16              | 33.49                | 50.50           | 76.06           | 164.7            | 40.10                 | 57.04           | 81.92           | 169.2            | 33.03           | 50.14            | 76.29            | 165.4             |
| 17              | 31.02                | 48.72           | 75.06           | 165.4            | 33.12                 | 47.97           | 71.48           | 162.2            | 33.99           | 51.78            | 78.22            | 167.3             |
| 18              | 31.69                | 49.47           | 75.64           | 164.7            | 25.87                 | 42.73           | 67.65           | 155.2            | 40.65           | 58.71            | 85.49            | 174.9             |
| 19              | 31.78                | 48.79           | 75.49           | 165.4            | 22.80                 | 39.01           | 64.20           | 152.7            | 24.02           | 41.38            | 68.40            | 157.1             |
| 20              | 31.72                | 49.14           | 75.08           | 164.1            | 35.75                 | 52.12           | 76.82           | 164.7            | 32.77           | 49.18            | 75.80            | 164.7             |
| 21              | 32.14                | 49.54           | 75.75           | 164.7            | 27.40                 | 44.03           | 67.87           | 155.3            | 42.00           | 60.13            | 87.36            | 176.2             |
| 22              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 23              | 33.39                | 50.94           | 77.13           | 167.9            | 27.42                 | 44.91           | 70.64           | 159.0            | 27.85           | 45.62            | 72.40            | 161.6             |
| 24              | 35.75                | 52.97           | 78.93           | 167.9            | 26.62                 | 44.16           | 69.44           | 157.7            | 38.94           | 56.68            | 83.82            | 173.0             |
| 25              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 26              | 25.54                | 42.64           | 68.65           | 157.7            | 31.20                 | 48.07           | 73.10           | 161.2            | 44.83           | 62.75            | 89.70            | 179.4             |
| 27              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 28              | 31.79                | 49.51           | 75.89           | 164.7            | 35.81                 | 53.04           | 78.90           | 167.9            | 32.40           | 49.77            | 76.30            | 164.7             |
| 29              | 31.80                | 48.94           | 75.56           | 166.0            | 31.80                 | 49.28           | 75.60           | 164.7            | 27.90           | 45.58            | 72.31            | 162.2             |
| 30              | 32.50                | 49.75           | 76.44           | 166.0            | 33.10                 | 50.50           | 76.67           | 165.4            | 26.81           | 44.86            | 71.75            | 160.9             |
| 31              | 32.80                | 49.24           | 75.71           | 166.0            | 30.56                 | 48.01           | 73.30           | 162.2            | 15.90           | 33.50            | 60.01            | 147.9             |
| 32              | 25.15                | 42.50           | 68.55           | 159.0            | 34.00                 | 51.02           | 76.27           | 165.0            | 40.45           | 58.89            | 85.30            | 174.9             |
| 33              | NR                   | 45.88           | 70.17           | 159.0            | 21.00                 | 38.31           | 63.20           | 149.9            | 23.33           | 40.66            | 67.07            | 155.8             |
| 34              | NR                   | 52.00           | 78.20           | 166.6            | 22.56                 | 37.50           | 62.53           | 150.7            | 40.64           | 58.77            | 85.43            | 174.9             |
| 35              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 36              | 39.38                | 55.76           | 82.03           | 171.7            | 38.60                 | 55.51           | 81.03           | 168.6            | 28.06           | 45.49            | 55.86            | 161.6             |
| 37              | 31.90                | 49.65           | 76.08           | 165.0            | 33.10                 | 50.51           | 75.56           | 163.5            | 32.17           | 49.53            | 75.86            | 165.0             |
| 38              | 28.19                | 44.85           | 71.62           | 159.6            | 28.60                 | 45.80           | 71.20           | 159.0            | 24.95           | 42.80            | 69.48            |                   |
| 39              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 40              | 30.26                | 47.70           | 73.90           | 162.8            | 27.21                 | 44.31           | 69.30           | 156.5            | 41.17           | 62.16            | 86.06            | 175.5             |
| 41              | 27.77                | 45.15           | 71.24           | 159.6            | 36.30                 | 53.40           | 79.91           | 167.9            | 40.10           | 58.03            | 84.69            | 173.6             |
| 42              | 31.89                | 48.96           | 75.01           | 164.0            | 38.63                 | 56.03           | 81.55           | 169.2            | 33.66           | 50.80            | 76.90            | 166.0             |
| 43              | 34.82                | 52.19           | 78.65           | 178.0            | 33.43                 | 50.24           | 74.12           | 162.0            | 34.00           | 51.93            | 78.75            | 168.6             |
| 44              | 25.79                | 42.97           | 68.92           | 158.4            | 35.75                 | 51.67           | 75.66           | 162.0            | 40.19           | 57.80            | 84.68            | 173.6             |
| 45              | 37.40                | 52.75           | 79.50           | 169.0            | 29.74                 | 46.90           | 72.32           | 159.6            | 35.28           | 52.71            | 79.09            | 168.6             |
| 46              | 25.40                | 43.04           | 69.57           | 158.4            | 32.00                 | 47.13           | 71.94           | 157.8            | 40.70           | 58.75            | 86.02            | 174.9             |
| 47              | 24.50                | 39.36           | 68.38           | 159.0            | 33.00                 | 46.87           | 71.32           | 155.8            | 41.75           | 63.85            | 87.14            | 180.0             |
| 48              | 27.90                | 45.07           | 71.20           | 160.0            | 24.54                 | 42.45           | 67.71           | 155.5            | 41.87           | 59.93            | 87.34            | 176.0             |
| 49              | 29.14                | 46.53           | 72.90           | 162.0            | 31.49                 | 46.81           | 69.58           | 157.0            | 29.30           | 47.27            | 74.06            | 164.0             |
| 50              | 33.46                | 50.19           | 76.56           | 166.0            | 30.90                 | 47.94           | 72.63           | 160.0            | 39.19           | 56.84            | 84.36            | 174.0             |
| 51              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 52              | 29.55                | 47.06           | 73.10           | 162.0            | 33.10                 | 49.96           | 75.10           | 165.0            | 36.62           | 54.61            | 81.40            | 169.8             |
| 53              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 54              | 27.66                | 44.90           | 71.57           | 161.0            | 32.76                 | 50.08           | 75.41           | 163.0            | 39.00           | 56.76            | 84.02            | 174.0             |
| 55              | 40.04                | 56.80           | 83.31           | 173.0            | 43.30                 | 60.23           | 85.90           | 171.7            | 27.03           | 44.05            | 70.14            | 159.0             |
| 56              | 32.31                | 49.34           | 75.56           | 165.0            | 24.29                 | 40.90           | 66.11           | 154.0            | 42.15           | 59.63            | 87.00            | 176.0             |
| 57              | 30.79                | 48.28           | 74.71           | 164.5            | 32.51                 | 48.27           | 73.21           | 159.0            | 35.72           | 53.59            | 80.29            | 171.0             |

TABLE 4-12. TEST 6 TIME OF ARRIVAL DATA (Continued)

| EVENT<br>NUMBER | TIME OF ARRIVAL (ms) |                 |                 |                  |                       |                 |                 |                  |                 |                  |                  |                   |
|-----------------|----------------------|-----------------|-----------------|------------------|-----------------------|-----------------|-----------------|------------------|-----------------|------------------|------------------|-------------------|
|                 | POSITION NUMBER      |                 |                 |                  |                       |                 |                 |                  |                 |                  |                  |                   |
|                 | P1<br>(48.9 ft)      | P2<br>(69.1 ft) | P3<br>(98.3 ft) | P4<br>(199.3 ft) | P5<br>(49.6 ft)       | P6<br>(69.9 ft) | P7<br>(99.2 ft) | P8<br>(199.5 ft) | P9<br>(48.9 ft) | P10<br>(68.7 ft) | P11<br>(98.9 ft) | P12<br>(198.6 ft) |
| 58              | 30.92                | 48.49           | 75.00           | 165.0            | 25.44                 | 42.58           | 67.76           | 155.0            | 36.90           | 55.30            | 81.28            | 171.0             |
| 59              | 30.54                | 48.00           | 74.46           | 164.0            | 34.69                 | 52.30           | 77.49           | 166.0            | 35.05           | 52.51            | 78.94            | 168.0             |
| 60              | 26.50                | 44.11           | 70.41           | 159.5            | 32.40                 | 49.41           | 74.85           | 162.0            | 40.78           | 58.42            | 85.41            | 175.0             |
| 61              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 62              | 22.19                | 40.10           | 65.79           | 156.0            | 31.74                 | 47.67           | 72.28           | 159.0            | 43.70           | 61.32            | 88.34            | 178.0             |
| 63              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 64              | 27.51                | 44.59           | 71.20           | 159.0            | 24.95                 | 40.10           | 64.72           | 152.7            | 17.20           | 34.43            | 61.05            | 151.0             |
| 65              | 99.20                | 104.30          | 117.70          | 181.9            | 57.39                 | 40.99           | 21.00           | 67.4             | 131.00          | 146.30           | 173.60           | 262.0             |
| 66              | 32.17                | 49.48           | 76.18           | 165.0            | 25.65                 | 42.89           | 68.15           | 156.0            | 24.07           | 42.00            | 68.03            | 157.5             |
| 67              | 30.72                | 48.09           | 75.00           | 165.0            | 35.87                 | 53.14           | 78.03           | 167.0            | 31.72           | 49.15            | 75.10            | 165.0             |
| 68              | 30.95                | 48.50           | 74.96           | 165.0            | 36.08                 | 53.21           | 78.20           | 167.0            | 36.04           | 53.91            | 81.06            | 171.0             |
| 69              | 33.65                | 50.94           | 77.51           | 167.0            | 26.19                 | 43.55           | 69.18           | 157.5            | 35.16           | 52.99            | 79.85            | 169.5             |
| 70              | 25.24                | 42.80           | 69.06           | 157.0            | 24.80                 | 48.40           | 74.56           | 163.0            | 29.60           | 47.70            | 73.80            | 162.8             |
| 71              | 8.90                 | 26.10           | 52.70           | 140.6            | 3.20                  | 20.30           | 45.00           | 132.9            | 10.20           | 28.00            | 54.70            | 144.4             |
| 72              | 29.43                | 46.40           | 72.50           | 162.2            | 22.30                 | 37.75           | 62.25           | 148.0            | 42.83           | 60.67            | 88.00            | 175.5             |
| 73              | 37.96                | 54.76           | 81.44           | 171.0            | NR                    | 54.10           | 82.13           | 165.0            | 28.36           | 45.24            | 71.65            | 161.0             |
| 74              | 29.98                | 47.53           | 73.58           | 162.0            | NR                    | 45.00           | 69.92           | 159.0            | 21.92           | 36.55            | 62.96            | 152.5             |
| 75              | 39.97                | 57.83           | 83.92           | 173.0            | NR                    | 62.00           | 86.36           | 174.0            | 22.87           | 39.43            | 65.18            | 153.9             |
| 76              | 31.30                | 48.50           | 74.44           | 163.5            | NR                    | 38.35           | 63.38           | 150.7            | 39.59           | 57.48            | 84.45            | 174.0             |
| 77              | 28.67                | 45.84           | 71.90           | 161.0            | NR                    | 47.50           | 72.91           | 159.0            | 34.37           | 51.70            | 77.55            | 167.5             |
| 78              | 26.02                | 42.58           | 69.27           | 159.0            | NR                    | 42.19           | 67.74           | 156.0            | 40.90           | 59.06            | 85.76            | 175.0             |
| 79              | 25.22                | 42.45           | 68.94           | 157.5            | NR                    | 50.20           | 75.70           | 163.0            | 39.99           | 58.18            | 84.42            | 174.0             |
| 80              | 21.38                | 38.75           | 64.88           | 154.0            | NR                    | 50.90           | 76.46           | 164.0            | 45.80           | 63.96            | 90.61            | 180.0             |
| 81              | 24.68                | 41.93           | 66.81           | 156.5            | 30.80                 | 47.66           | 72.89           | 162.0            | 43.65           | 61.12            | 88.22            | 178.0             |
| 82              | 29.30                | 46.10           | 73.10           | 162.0            | 31.91                 | 48.91           | 75.10           | 163.0            | 37.24           | 55.05            | 81.61            | 171.0             |
| 83              | 29.73                | 47.53           | 73.80           | 165.0            | 32.21                 | 49.39           | 75.00           | 163.0            | 32.60           | 50.39            | 77.27            | 167.0             |
| 84              | 25.18                | 42.50           | 69.02           | 159.0            | 24.40                 | 41.34           | 66.41           | 154.0            | 43.90           | 62.47            | 89.17            | 178.0             |
| 85              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 86              | 30.44                | 48.48           | 75.70           | 163.0            | 27.59                 | 43.93           | 68.41           | 156.0            | 27.10           | 44.66            | 71.19            | 161.0             |
| 87              | 29.41                | 46.21           | 73.10           | 162.0            | 17.80                 | 34.70           | 59.80           | 148.0            | 42.19           | 60.51            | 86.95            | 177.0             |
| 88              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 89              | 33.10                | 49.79           | 75.47           | 165.0            | 23.17                 | 39.96           | 65.49           | 154.5            | 24.72           | 42.04            | 68.33            | 157.5             |
| 90              | 36.41                | 53.83           | 79.59           | 171.0            | 35.53                 | 52.04           | 76.54           | 165.0            | 26.27           | 43.30            | 69.48            | 158.0             |
| 91              | 30.50                | 48.91           | 75.26           | 165.0            | 34.30                 | 50.45           | 74.36           | 163.0            | 33.10           | 50.28            | 77.48            | 167.0             |
| 92              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 93              | 22.05                | 37.95           | 64.29           | 153.0            | 36.90                 | 52.57           | 77.73           | 165.0            | 45.20           | 63.00            | 89.67            | 180.0             |
| 94              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 95              | 40.10                | 57.91           | 83.41           | 165.0            | 28.29                 | 44.87           | 69.96           | 158.0            | 33.04           | 50.47            | 77.27            | 166.5             |
| 96              | 35.30                | 52.35           | 78.41           | 169.0            | 22.96                 | 38.97           | 61.55           | 151.0            | 36.90           | 54.10            | 80.10            | 170.0             |
| 97              | 24.83                | 41.95           | 68.34           | 157.0            | 35.00                 | 51.37           | 76.32           | 162.0            | 41.99           | 59.51            | 86.30            | 176.0             |
| 98              |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 99              | 33.73                | 51.32           | 78.05           | 168.0            | 32.49                 | 48.84           | 73.80           | 161.0            | 31.72           | 49.58            | 75.96            | 165.0             |
| 100             | 33.59                | 51.06           | 77.64           | 168.0            | 34.44                 | 51.51           | 77.19           | 162.0            | 33.85           | 51.65            | 78.13            | 167.0             |
| 101             | 37.05                | 54.02           | 80.12           | 170.5            | 22.58                 | 39.19           | 64.44           | 153.0            | 37.85           | 55.08            | 81.83            | 171.1             |
| 102             | 22.30                | 39.65           | 65.84           | 156.0            | 32.40                 | 49.40           | 74.84           | 162.2            | 47.64           | 64.59            | 91.66            | 177.9             |
| 103             | 29.86                | 47.09           | 73.41           | 163.0            | 15.30                 | 31.20           | 55.74           | 141.8            | 24.47           | 41.11            | 66.88            | 156.0             |
| 104             | 33.70                | 51.33           | 77.67           | 167.3            | 21.00                 | 37.63           | 63.00           | 150.3            | 29.09           | 46.35            | 72.41            | 160.9             |
| 105             | 27.64                | 44.99           | 71.42           | 160.9            | 37.29                 | 54.16           | 80.09           | 167.9            | 40.17           | 57.80            | 84.72            | 174.3             |
| 106             | 34.33                | 51.68           | 77.77           | 167.0            | 37.17                 | 54.42           | 80.15           | 168.5            | 26.54           | 43.39            | 69.35            | 158.4             |
| 107             | 30.75                | 47.74           | 74.25           | 165.0            | 31.53                 | 48.14           | 73.50           | 161.5            | 30.11           | 47.25            | 73.41            | 162.0             |
| 108             | 37.23                | 54.66           | 81.02           | 171.1            | 34.05                 | 50.74           | 76.16           | 165.0            | 27.42           | 44.97            | 71.90            | 160.9             |
| 109             | 30.06                | 46.63           | 73.24           | 163.0            | 35.24                 | 52.29           | 77.25           | 166.0            | 32.52           | 49.67            | 75.73            | 164.0             |
| 110             | 29.01                | 44.75           | 71.36           | 161.1            | 28.74                 | 45.85           | 71.52           | 159.0            | 44.92           | 62.85            | 89.34            | 179.4             |
| 111             | 25.56                | 41.43           | 67.99           | 158.4            | 30.28                 | 47.34           | 73.05           | 160.9            | 39.81           | 57.13            | 84.50            | 174.3             |
| 112             | 34.91                | 50.54           | 77.50           | 167.0            | 22.30                 | 39.29           | 64.81           | 153.0            | 33.02           | 50.50            | 77.35            | 167.0             |
| 113             | 24.50                | 39.40           | 67.40           | 155.8            | 33.10                 | 50.20           | 75.70           | 164.7            | 39.40           | 57.20            | 84.00            | 173.6             |
| 114             |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |

TABLE 4-12. TEST 6 TIME OF ARRIVAL DATA (Continued)

| EVENT<br>NUMBER | TIME OF ARRIVAL (ms) |                 |                 |                  |                 |                       |                 |                  |                 |                  |                  |                   |
|-----------------|----------------------|-----------------|-----------------|------------------|-----------------|-----------------------|-----------------|------------------|-----------------|------------------|------------------|-------------------|
|                 | POSITION NUMBER      |                 |                 |                  |                 |                       |                 |                  |                 |                  |                  |                   |
|                 | P1<br>(48.9 ft)      | P2<br>(69.1 ft) | P3<br>(98.3 ft) | P4<br>(199.3 ft) | P5<br>(49.6 ft) | P6<br>(69.9 ft)       | P7<br>(99.2 ft) | P8<br>(199.5 ft) | P9<br>(48.9 ft) | P10<br>(68.7 ft) | P11<br>(98.9 ft) | P12<br>(198.6 ft) |
| 115             | 35.21                | 53.95           | 80.33           | 168.6            | 27.62           | 44.82                 | 70.60           | 157.7            | 26.70           | 43.87            | 70.39            | 159.0             |
| 116             | 22.55                | 38.09           | 64.41           | 154.0            | 32.04           | 49.19                 | 74.41           | 162.0            | 44.49           | 62.56            | 86.14            | 178.0             |
| 117             | 34.27                | 51.32           | 78.05           | 168.0            | 31.31           | 47.92                 | 72.99           | 160.3            | 30.22           | 47.60            | 74.27            | 163.5             |
| 118             | 27.73                | 45.01           | 71.29           | 160.3            | 30.66           | 47.56                 | 72.74           | 160.3            | 34.65           | 52.12            | 78.47            | 167.0             |
| 119             | 21.22                | 38.19           | 64.27           | 153.5            | 35.51           | 52.48                 | 77.41           | 165.5            | 43.35           | 60.68            | 86.65            | 175.0             |
| 120             | 27.90                | 45.33           | 71.10           | 159.6            | 29.70           | 46.39                 | 71.44           | 159.0            | 33.80           | 50.90            | 76.91            | 165.0             |
| 121             | 36.47                | 52.49           | 79.41           | 168.6            | 23.41           | 40.19                 | 65.59           | 153.0            | 26.98           | 44.43            | 70.94            | 160.3             |
| 122             | 24.82                | 41.65           | 67.58           | 156.0            | 31.37           | 47.93                 | 73.25           | 161.0            | 37.60           | 55.52            | 82.46            | 171.0             |
| 123             | 29.01                | 46.30           | 72.66           | 163.5            | 27.13           | 43.78                 | 68.46           | 156.5            | 40.73           | 58.50            | 85.41            | 175.5             |
| 124             | 36.90                | 52.80           | 80.10           | 166.0            | 18.40           | 34.70                 | 58.50           | 145.7            | 32.40           | 49.60            | 75.10            | 163.5             |
| 125             | 39.40                | 56.00           | 83.30           | 167.3            | 34.90           | 49.60                 | 75.70           | 162.2            | 27.00           | 44.50            | 70.60            | 159.6             |
| 126             | 26.10                | 42.60           | 68.70           | 157.7            | 22.30           | 38.20                 | 63.60           | 150.0            | 46.10           | 64.90            | 91.60            | 181.3             |
| 127             | 35.60                | 52.20           | 79.50           | 169.2            | 21.30           | 38.50                 | 63.60           | 151.4            | 40.10           | 58.50            | 85.90            | 169.2             |
| 128             | 30.50                | 46.40           | 73.10           | 174.9            | 15.00           | 33.10                 | 58.50           | 146.3            | 13.40           | 30.80            | 57.20            | 146.3             |
| 129             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |
| 130             | 34.30                | 51.50           | 78.20           | 169.0            | 30.80           | 49.00                 | 75.10           | 162.8            | 33.70           | 51.50            | 78.90            | 167.9             |
| 131             | 29.59                | 47.08           | 73.99           | 163.0            | 26.62           | 43.99                 | 69.32           | 157.5            | 37.50           | 54.25            | 81.01            | 170.0             |
| 132             | 34.30                | 51.50           | 78.20           | 168.6            | 22.90           | 40.10                 | 69.32           | 153.0            | 38.80           | 54.25            | 81.01            | 172.4             |
| 133             | 45.30                | 63.06           | 89.57           | 180.0            | 36.48           | 53.62                 | 79.01           | 167.0            | 19.70           | 37.05            | 63.31            | 152.5             |
| 134             | 35.14                | 52.20           | 78.88           | 170.0            | 32.73           | 49.51                 | 74.54           | 162.0            | 32.40           | 50.01            | 77.00            | 166.5             |
| 135             | 37.44                | 54.48           | 80.87           | 171.5            | 35.00           | 53.00                 | 78.20           | 166.0            | 33.74           | 51.40            | 78.02            | 168.0             |
| 136             | 31.08                | 48.27           | 74.72           | 165.0            | 33.89           | 51.31                 | 76.94           | 166.0            | 35.09           | 52.75            | 79.77            | 169.5             |
| 137             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |
| 138             | 38.25                | 55.04           | 81.24           | 173.0            | 26.38           | 43.05                 | 67.77           | 155.0            | 37.52           | 54.67            | 80.88            | 169.5             |
| 139             | 27.04                | 44.44           | 71.04           | 160.5            | 28.89           | 46.12                 | 71.81           | 160.0            | 39.66           | 57.61            | 85.00            | 174.0             |
| 140             | 32.26                | 49.44           | 76.07           | 166.0            | 32.47           | 49.82                 | 75.30           | 163.5            | 32.54           | 50.07            | 76.40            | 165.0             |
| 141             | 31.75                | 49.11           | 75.07           | 163.0            | 34.90           | 52.05                 | 77.61           | 166.0            | 30.62           | 47.77            | 73.79            | 162.0             |
| 142             | 38.90                | 55.96           | 82.77           | 173.0            | 30.15           | 47.20                 | 72.88           | 161.0            | 27.16           | 44.42            | 70.75            | 160.0             |
| 143             | 30.64                | 48.06           | 74.14           | 163.5            | 31.46           | 48.35                 | 73.84           | 162.0            | 35.18           | 52.55            | 78.90            | 167.0             |
| 144             | 37.74                | 55.32           | 82.15           | 172.0            | 28.26           | 45.35                 | 70.61           | 159.0            | 28.33           | 46.23            | 73.17            | 163.0             |
| 145             | 84.60                | 98.60           | 124.70          | NR               | 58.07           | 71.92                 | 92.90           | 175.5            | 26.82           | 32.40            | 49.60            | 129.8             |
| 146             | 33.07                | 49.77           | 75.06           | 163.0            | 43.55           | 60.49                 | 85.03           | 174.0            | 31.47           | 48.05            | 73.45            | 161.0             |
| 147             | 30.57                | 47.70           | 73.96           | 163.0            | 26.10           | 43.25                 | 68.90           | 157.0            | 41.90           | 60.05            | 87.10            | 176.2             |
| 148             | 31.67                | 49.19           | 75.57           | 166.0            | 24.54           | 41.73                 | 67.17           | 155.0            | 40.28           | 58.39            | 85.14            | 175.0             |
| 149             | 31.71                | 48.64           | 75.36           | 165.0            | 28.60           | 45.77                 | 71.42           | 159.0            | 30.34           | 48.07            | 74.74            | 165.0             |
| 150             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |
| 151             | 37.06                | 54.51           | 81.77           | 172.0            | 27.88           | 45.04                 | 70.45           | 157.5            | 26.65           | 44.13            | 70.61            | 160.5             |
| 152             | 32.69                | 50.11           | 76.57           | 166.5            | 22.12           | 38.66                 | 63.57           | 152.0            | 34.88           | 52.34            | 78.90            | 168.0             |
| 153             | 33.94                | 51.08           | 77.31           | 167.0            | 18.40           | 35.44                 | 60.52           | 148.5            | 44.25           | 61.49            | 88.29            | 177.0             |
| 154             | 25.79                | 43.71           | 70.20           | 160.5            | 27.62           | 44.42                 | 69.37           | 158.0            | 42.95           | 60.30            | 87.00            | 177.0             |
| 155             | 26.49                | 43.41           | 69.99           | 160.0            | 26.86           | 44.08                 | 69.45           | 157.5            | 44.74           | 62.50            | 88.30            | 180.0             |
| 156             | 32.20                | 49.43           | 75.95           | 168.0            | 31.80           | 48.83                 | 74.44           | 163.0            | 36.83           | 54.97            | 81.77            | 172.0             |
| 157             | 26.57                | 43.54           | 69.89           | 162.0            | 19.70           | 37.18                 | 62.67           | 152.0            | 21.39           | 38.63            | 65.48            | 155.0             |
| 158             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |
| 159             | 37.06                | 53.52           | 80.31           | 171.0            | 23.88           | 40.92                 | 66.28           | 154.5            | 34.72           | 52.48            | 79.26            | 169.0             |
| 160             | 35.77                | 52.26           | 78.84           | 170.5            | 17.80           | 34.75                 | 59.58           | 146.8            | 37.67           | 54.94            | 81.14            | 170.0             |
| 161             | 26.64                | 44.80           | 71.13           | 161.0            | 9.50            | 26.10                 | 55.31           | 139.9            | 31.80           | 49.25            | 76.24            | 166.0             |
| 162             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |
| 163             | 26.64                | 37.63           | 64.20           | 153.0            | 8.30            | 24.80                 | 53.97           | 137.0            | 17.80           | 35.20            | 61.70            | 152.0             |
| 164             | 41.19                | 58.05           | 84.49           | 174.0            | 26.86           | 43.26                 | 68.10           | 154.0            | 32.33           | 49.12            | 75.20            | 163.0             |
| 165             | 30.91                | 48.47           | 74.93           | 165.0            | 28.55           | 45.67                 | 70.54           | 159.0            | 40.15           | 57.81            | 84.59            | 174.0             |
| 166             | 22.09                | 39.36           | 65.82           | 156.0            | 18.40           | 36.56                 | 62.08           | 149.0            | 41.20           | 58.45            | 85.52            | 175.0             |
| 167             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |
| 168             | 40.45                | 57.29           | 84.17           | 171.0            | 33.50           | 50.72                 | 76.78           | 165.0            | 22.83           | 39.75            | 65.69            | 154.5             |
| 169             | 32.03                | 49.55           | 75.98           | 163.0            | 27.20           | 43.99                 | 69.46           | 157.0            | 32.90           | 50.41            | 76.81            | 166.0             |
| 170             | 31.76                | 49.00           | 75.69           | 165.0            | 28.71           | 45.60                 | 71.01           | 158.0            | 52.20           | 57.95            | 84.60            | 174.0             |
| 171             | 32.50                | 50.48           | 76.04           | 166.0            | 24.48           | 41.11                 | 66.57           | 155.0            | 33.94           | 51.83            | 78.77            | 168.0             |

TABLE 4-12. TEST 6 TIME OF ARRIVAL DATA (Continued)

| EVENT<br>NUMBER | TIME OF ARRIVAL (ms) |                 |                 |                  |                 |                       |                 |                  |                 |                  |                  |                   |
|-----------------|----------------------|-----------------|-----------------|------------------|-----------------|-----------------------|-----------------|------------------|-----------------|------------------|------------------|-------------------|
|                 | POSITION NUMBER      |                 |                 |                  |                 |                       |                 |                  |                 |                  |                  |                   |
|                 | P1<br>(48.9 ft)      | P2<br>(69.1 ft) | P3<br>(98.3 ft) | P4<br>(199.3 ft) | P5<br>(49.6 ft) | P6<br>(69.9 ft)       | P7<br>(99.2 ft) | P8<br>(199.5 ft) | P9<br>(48.9 ft) | P10<br>(68.7 ft) | P11<br>(98.9 ft) | P12<br>(198.6 ft) |
| 172             | 28.00                | 44.19           | 70.00           | 162.0            | 14.60           | 30.50                 | 55.30           | 143.7            | 23.00           | 40.70            | 67.40            | 156.0             |
| 173             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |
| 174             | 40.67                | 58.45           | 83.25           | 175.0            | 27.00           | 43.54                 | 68.00           | 156.0            | 20.40           | 37.45            | 63.87            | 153.0             |
| 175             | 33.89                | 51.44           | 77.86           | 168.0            | 28.87           | 45.80                 | 71.20           | 160.0            | 29.67           | 47.03            | 73.21            | 162.0             |
| 176             | 30.18                | 47.58           | 73.36           | 162.0            | 19.70           | 36.90                 | 62.04           | 149.1            | 41.24           | 58.69            | 86.01            | 174.0             |
| 177             | 33.99                | 50.95           | 77.96           | 168.0            | 26.79           | 44.01                 | 69.17           | 157.0            | 25.13           | 42.86            | 69.57            | 159.0             |
| 178             | 30.50                | 46.86           | 73.50           | 163.0            | 27.46           | 44.43                 | 70.05           | 158.0            | 34.74           | 52.44            | 79.46            | 169.5             |
| 179             | 36.71                | 51.78           | 78.16           | 168.0            | 19.10           | 35.06                 | 60.38           | 148.5            | 44.10           | 61.32            | 88.29            | 177.0             |
| 180             | 27.87                | 44.36           | 70.43           | 160.0            | 11.40           | 28.00                 | 52.80           | 141.0            | 39.68           | 57.16            | 84.52            | 174.0             |
| 181             |                      |                 |                 |                  |                 | No zero time          |                 |                  |                 |                  |                  |                   |
| 182             | 21.66                | 39.03           | 65.22           | 155.0            | 27.47           | 45.20                 | 71.16           | 75.7             | NR              | 66.10            | 92.20            | 70.0              |
| 183             | 38.75                | 56.86           | 82.77           | 171.0            | 29.25           | 45.81                 | 66.22           | 158.0            | 29.59           | 46.97            | 73.45            | 162.0             |
| 184             | 24.25                | 41.07           | 66.78           | 156.0            | 35.88           | 52.84                 | 77.52           | 165.0            | 41.22           | 58.36            | 84.40            | 173.0             |
| 185             | 39.23                | 56.54           | 83.02           | 171.0            | 32.55           | 49.90                 | 75.36           | 163.5            | 28.98           | 46.59            | 73.19            | 162.0             |
| 186             | 23.09                | 39.77           | 65.50           | 154.7            | 25.43           | 42.52                 | 67.57           | 154.9            | 43.42           | 61.12            | 87.38            | 176.0             |
| 187             | 25.12                | 42.64           | 68.90           | 159.0            | 31.39           | 48.33                 | 74.12           | 163.5            | 44.17           | 61.65            | 88.97            | 178.0             |
| 188             | 42.87                | 60.61           | 86.43           | 178.0            | 37.86           | 54.89                 | 80.09           | 168.0            | 22.04           | 38.93            | 64.91            | 153.0             |
| 189             | 26.54                | 43.99           | 70.33           | 161.0            | 28.89           | 45.83                 | 71.40           | 160.0            | 44.18           | 61.70            | 88.54            | 177.0             |
| 190             | 33.39                | 50.52           | 77.43           | 168.0            | 29.93           | 47.25                 | 72.96           | 160.0            | 35.48           | 53.41            | 80.16            | 170.0             |
| 191             | 34.31                | 51.50           | 78.04           | 165.0            | 25.94           | 42.54                 | 68.42           | 157.0            | 19.10           | 36.19            | 62.76            | 152.0             |
| 192             | 19.10                | 36.15           | 62.17           | 152.0            | 33.41           | 49.34                 | 74.51           | 162.0            | 47.56           | 64.59            | 91.78            | 182.0             |
| 193             | 34.45                | 51.17           | 77.67           | 168.0            | 29.62           | 46.94                 | 72.76           | 161.0            | 21.64           | 39.06            | 65.43            | 154.5             |
| 194             | 34.78                | 51.81           | 78.18           | 167.0            | 18.40           | 35.30                 | 61.00           | 148.5            | 43.46           | 61.14            | 87.90            | 177.0             |
| 195             | 46.70                | 64.80           | 91.04           | 180.0            | 43.84           | 61.33                 | 85.20           | 174.0            | 18.00           | 34.84            | 60.76            | 148.5             |
| 196             | 29.75                | 47.11           | 73.51           | 163.5            | 24.54           | 41.90                 | 67.36           | 157.0            | 42.70           | 60.24            | 87.00            | 177.0             |
| 197             | 37.71                | 55.16           | 81.61           | 171.0            | 35.62           | 52.59                 | 77.95           | 167.0            | 29.24           | 46.49            | 72.81            | 162.0             |
| 198             | 26.65                | 44.33           | 70.60           | 161.0            | 31.68           | 49.15                 | 75.25           | 165.0            | 42.11           | 59.67            | 86.06            | 175.0             |
| 199             | 17.20                | 33.96           | 59.17           | 148.0            | 32.92           | 49.76                 | 75.49           | 163.5            | 48.46           | 65.85            | 92.90            | 181.0             |
| 200             | 25.99                | 44.26           | 70.69           | 162.0            | 28.53           | 45.28                 | 70.83           | 161.0            | 35.35           | 52.83            | 79.12            | 168.0             |
| 201             | 36.13                | 52.89           | 78.93           | 168.0            | 23.17           | 39.60                 | 64.45           | 151.8            | 32.40           | 49.84            | 76.23            | 165.0             |
| 202             | 36.83                | 53.81           | 79.43           | 171.0            | 25.17           | 41.21                 | 65.70           | 153.5            | 37.71           | 55.03            | 81.40            | 171.0             |
| 203             | 25.63                | 43.19           | 69.37           | 160.0            | 26.50           | 40.92                 | 67.68           | 156.0            | 45.14           | 63.12            | 89.51            | 177.0             |
| 204             | 25.67                | 42.29           | 67.75           | 156.0            | 35.74           | 52.03                 | 72.76           | 165.0            | 40.08           | 56.89            | 82.63            | 171.0             |
| 205             | 30.34                | 47.62           | 73.69           | 162.0            | 22.99           | 39.64                 | 64.64           | 152.2            | 45.26           | 63.09            | 89.63            | 178.5             |
| 206             | 28.31                | 45.44           | 71.53           | 162.0            | 25.26           | 41.99                 | 67.23           | 155.0            | 46.32           | 64.34            | 91.07            | 180.0             |
| 207             | 34.59                | 52.64           | 79.29           | 168.0            | 28.05           | 44.84                 | 70.23           | 159.0            | 31.22           | 48.54            | 74.85            | 163.5             |
| 208             | 30.20                | 47.19           | 73.27           | 162.0            | 37.00           | 53.41                 | 79.10           | 168.0            | 36.25           | 53.11            | 79.00            | 167.0             |
| 209             | 31.00                | 47.59           | 74.00           | 164.0            | 19.70           | 37.88                 | 63.01           | 151.0            | 29.38           | 46.91            | 73.34            | 162.0             |
| 210             | 37.24                | 54.02           | 79.66           | 168.0            | 15.30           | 32.40                 | 57.21           | 145.0            | 44.56           | 61.93            | 88.51            | 177.0             |
| 211             | 23.73                | 40.66           | 66.42           | 156.0            | 32.95           | 50.54                 | 75.81           | 165.0            | 41.01           | 58.06            | 83.92            | 172.0             |
| 212             | 42.82                | 59.67           | 86.26           | 175.0            | 25.89           | 41.87                 | 66.47           | 153.5            | 33.72           | 50.16            | 75.75            | 163.5             |
| 213             | 28.99                | 46.69           | 73.07           | 163.0            | 34.25           | 51.56                 | 77.38           | 167.0            | 42.62           | 60.29            | 86.84            | 176.0             |
| 214             | 33.76                | 50.94           | 77.09           | 167.0            | 23.47           | 39.61                 | 64.60           | 152.0            | 12.70           | 29.30            | 54.94            | 143.0             |
| 215             | 32.24                | 49.83           | 76.21           | 166.0            | 27.97           | 45.08                 | 70.84           | 159.0            | 41.01           | 58.34            | 84.87            | 174.0             |
| 216             | 21.00                | 37.64           | 63.57           | 153.0            | 36.62           | 53.98                 | 80.08           | 168.0            | 42.75           | 59.97            | 85.98            | 174.0             |
| 217             | 28.19                | 46.39           | 72.53           | 162.0            | 34.14           | 51.59                 | 77.42           | 167.0            | 38.76           | 56.25            | 82.52            | 171.0             |
| 218             | 34.09                | 51.75           | 78.03           | 168.5            | 28.88           | 46.41                 | 72.24           | 161.0            | 32.91           | 50.53            | 77.03            | 167.0             |
| 219             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |
| 220             | 29.80                | 48.59           | 75.02           | 165.0            | 33.10           | 50.20                 | 76.51           | 165.5            | 38.75           | 56.64            | 83.34            | 172.5             |
| 221             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |
| 222             | 39.99                | 54.41           | 78.20           | 165.0            | 6.40            | 21.60                 | 45.20           | 132.5            | 57.75           | 76.30            | 101.80           | 191.0             |
| 223             | 29.31                | 46.73           | 72.68           | 162.0            | 29.09           | 45.50                 | 70.82           | 160.0            | 35.12           | 52.38            | 77.09            | 167.0             |
| 224             | 29.31                | 37.80           | 64.27           | 154.1            | 34.52           | 51.80                 | 77.30           | 167.0            | 52.24           | 69.82            | 95.40            | 186.0             |
| 225             | 33.62                | 51.20           | 77.72           | 168.0            | 17.20           | 33.70                 | 59.08           | 148.0            | 40.04           | 57.32            | 83.82            | 173.0             |
| 226             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |
| 227             | 23.41                | 40.58           | 66.63           | 156.0            | 36.61           | 54.84                 | 80.78           | 169.0            | 44.68           | 61.74            | 87.79            | 176.0             |
| 228             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |

TABLE 4-12. TEST 6 TIME OF ARRIVAL DATA (Continued)

| EVENT<br>NUMBER | TIME OF ARRIVAL (ms) |                 |                 |                  |                 |                       |                 |                  |                 |                  |                  |                   |
|-----------------|----------------------|-----------------|-----------------|------------------|-----------------|-----------------------|-----------------|------------------|-----------------|------------------|------------------|-------------------|
|                 | POSITION NUMBER      |                 |                 |                  |                 |                       |                 |                  |                 |                  |                  |                   |
|                 | P1<br>(48.9 ft)      | P2<br>(69.1 ft) | P3<br>(98.3 ft) | P4<br>(199.3 ft) | P5<br>(49.6 ft) | P6<br>(69.9 ft)       | P7<br>(99.2 ft) | P8<br>(199.5 ft) | P9<br>(48.9 ft) | P10<br>(68.7 ft) | P11<br>(98.9 ft) | P12<br>(198.6 ft) |
| 229             | 51.88                | 68.74           | 96.00           | 186.0            | 41.89           | 58.42                 | 83.37           | 171.0            | 19.70           | 34.83            | 60.50            | 148.5             |
| 230             | 30.58                | 48.02           | 74.35           | 163.5            | 31.17           | 47.92                 | 71.27           | 161.0            | 40.80           | 58.52            | 85.23            | 175.0             |
| 231             | 27.92                | 45.09           | 71.09           | 161.0            | 24.37           | 39.93                 | 64.11           | 152.5            | 43.74           | 61.56            | 88.34            | 178.0             |
| 232             | 25.69                | 43.26           | 69.85           | 159.0            | 22.66           | 39.31                 | 64.25           | 151.0            | 29.17           | 46.92            | 73.61            | 164.0             |
| 233             | 48.89                | 68.08           | 92.90           | 182.0            | 29.30           | 44.59                 | 69.77           | 157.0            | 28.14           | 43.03            | 67.83            | 155.0             |
| 234             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |
| 235             | 37.55                | 54.75           | 81.10           | 171.0            | 28.85           | 45.78                 | 71.06           | 159.0            | 34.26           | 51.52            | 77.98            | 167.0             |
| 236             | 29.30                | 46.77           | 72.70           | 163.0            | 26.51           | 43.38                 | 68.50           | 156.0            | 44.86           | 62.61            | 89.83            | 180.0             |
| 237             | 26.63                | 43.65           | 69.57           | 159.0            | 28.97           | 45.89                 | 71.14           | 159.0            | 44.40           | 62.12            | 89.60            | 178.0             |
| 238             |                      |                 |                 |                  |                 | No zero time          |                 |                  |                 |                  |                  |                   |
| 239             | 22.76                | 39.75           | 65.59           | 154.6            | 26.31           | 42.25                 | 67.08           | 154.5            | 48.06           | 65.93            | 92.50            | 183.0             |
| 240             | 22.76                | 38.65           | 64.63           | 153.8            | 26.51           | 42.56                 | 67.33           | 154.9            | 37.95           | 54.85            | 81.17            | 171.0             |
| 241             | 15.00                | 30.50           | 57.44           | 147.0            | 11.40           | 27.30                 | 52.96           | 139.0            | 32.81           | 50.90            | 77.62            | 168.0             |
| 242             | 31.83                | 49.20           | 74.88           | 163.0            | 22.28           | 38.69                 | 63.50           | 150.0            | 42.30           | 60.05            | 86.74            | 175.5             |
| 243             | 37.52                | 54.57           | 80.86           | 172.0            | 30.29           | 46.80                 | 72.17           | 159.0            | 33.89           | 51.62            | 78.42            | 168.0             |
| 244             | 33.51                | 50.67           | 76.55           | 167.0            | 29.47           | 45.46                 | 70.67           | 158.0            | 28.99           | 46.60            | 73.14            | 162.0             |
| 245             | 23.41                | 40.50           | 66.39           | 155.0            | 32.64           | 49.36                 | 74.49           | 162.0            | 43.11           | 60.89            | 87.23            | 176.0             |
| 246             |                      |                 |                 |                  |                 | No zero time          |                 |                  |                 |                  |                  |                   |
| 247             | 22.90                | 41.30           | 67.40           | 156.0            | 24.20           | 41.30                 | 66.80           | 155.0            | 35.02           | 52.91            | 79.90            | 171.0             |
| 248             |                      |                 |                 |                  |                 | No zero time          |                 |                  |                 |                  |                  |                   |
| 249             | 25.80                | 42.67           | 68.38           | 157.0            | 24.78           | 40.99                 | 65.66           | 152.6            | 45.48           | 63.21            | 90.21            | 180.0             |
| 250             | 46.45                | 63.28           | 89.87           | 180.0            | 39.08           | 56.70                 | 81.61           | 172.0            | 23.74           | 40.80            | 67.03            | 156.0             |
| 251             | 30.34                | 46.69           | 73.10           | 163.0            | 20.00           | 36.80                 | 62.08           | 150.2            | 31.62           | 49.41            | 76.30            | 165.0             |
| 252             |                      |                 |                 |                  |                 | No zero time          |                 |                  |                 |                  |                  |                   |
| 253             | 42.82                | 60.53           | 87.12           | 177.0            | 35.02           | 51.93                 | 77.63           | 165.5            | 26.74           | 43.46            | 69.33            | 158.0             |
| 254             | 55.45                | 72.63           | 99.40           | 191.0            | 45.28           | 62.04                 | 87.25           | 175.0            | 21.78           | 37.65            | 63.39            | 152.0             |
| 255             | 26.90                | 44.13           | 70.08           | 159.3            | 32.25           | 49.13                 | 74.45           | 162.0            | 39.44           | 57.15            | 83.62            | 172.5             |
| 256             | 32.06                | 49.45           | 75.55           | 165.0            | 21.78           | 35.63                 | 60.81           | 149.0            | 39.18           | 56.46            | 82.83            | 172.0             |
| 257             | 31.07                | 48.71           | 75.03           | 165.0            | 28.45           | 46.06                 | 71.97           | 161.5            | 31.08           | 48.64            | 75.13            | 164.0             |
| 258             | 26.01                | 40.92           | 65.94           | 154.6            | 25.46           | 39.90                 | 64.23           | 152.2            | 60.00           | 80.30            | 108.30           | 198.2             |
| 259             | 35.36                | 52.72           | 79.26           | 169.0            | 26.74           | 43.66                 | 68.93           | 157.0            | 31.43           | 48.65            | 74.88            | 163.5             |
| 260             | 21.92                | 38.21           | 63.55           | 152.0            | 26.59           | 42.41                 | 67.15           | 155.0            | 51.52           | 69.23            | 96.00            | 186.0             |
| 261             | 34.01                | 50.83           | 76.47           | 165.0            | 21.30           | 38.08                 | 63.27           | 152.0            | 48.35           | 65.65            | 93.00            | 183.0             |
| 262             | 35.54                | 52.52           | 79.04           | 169.0            | 33.26           | 50.83                 | 76.48           | 165.0            | 33.57           | 51.27            | 77.93            | 167.0             |
| 263             |                      |                 |                 |                  |                 | No separate zero time |                 |                  |                 |                  |                  |                   |
| 264             | 31.72                | 48.93           | 75.01           | 163.0            | 26.41           | 43.36                 | 68.80           | 157.5            | 44.83           | 62.67            | 89.51            | 178.0             |
| 265             | 36.71                | 54.14           | 80.55           | 171.0            | 27.99           | 45.06                 | 70.56           | 159.0            | 38.39           | 55.71            | 82.15            | 172.0             |
| 266             | 27.65                | 45.11           | 71.37           | 161.0            | 34.68           | 51.65                 | 77.21           | 165.3            | 41.62           | 59.30            | 85.77            | 175.0             |
| 267             | 35.21                | 52.53           | 78.50           | 168.0            | 34.12           | 51.23                 | 76.50           | 165.0            | 27.97           | 45.00            | 71.10            | 159.5             |
| 268             | 33.16                | 46.66           | 70.24           | 156.5            | 12.70           | 26.10                 | 49.70           | 135.5            | 60.50           | 78.40            | 105.10           | 195.0             |
| 269             | 28.24                | 45.60           | 71.79           | 161.5            | 34.33           | 51.33                 | 76.51           | 164.0            | 38.35           | 56.05            | 82.42            | 171.0             |
| 270             | 26.46                | 43.58           | 70.16           | 159.0            | 18.00           | 35.26                 | 60.66           | 158.0            | 24.26           | 41.78            | 68.23            | 158.0             |
| 271             | 29.24                | 46.60           | 72.71           | 162.0            | 34.72           | 52.16                 | 77.54           | 165.0            | 36.23           | 53.55            | 79.70            | 168.0             |
| 272             | 36.67                | 54.93           | 80.53           | 169.5            | 37.77           | 55.36                 | 80.86           | 169.5            | 25.09           | 41.97            | 67.89            | 156.3             |
| 273             | 32.50                | 49.93           | 76.00           | 165.0            | 37.09           | 54.25                 | 79.56           | 168.0            | 31.25           | 48.70            | 74.81            | 163.0             |
| 274             | 30.83                | 48.48           | 74.82           | 165.0            | 30.32           | 47.67                 | 72.66           | 161.0            | 43.94           | 61.58            | 88.16            | 177.0             |
| 275             | 30.21                | 47.53           | 73.75           | 163.0            | 30.44           | 47.76                 | 73.30           | 162.0            | 40.68           | 58.17            | 84.64            | 159.0             |
| 276             | 28.20                | 46.22           | 72.25           | 162.0            | 33.77           | 51.12                 | 76.58           | 165.0            | 38.42           | 55.78            | 81.98            | 172.0             |
| 277             | 21.00                | 37.79           | 63.77           | 153.2            | 33.70           | 49.98                 | 75.03           | 163.0            | 51.92           | 69.59            | 96.80            | 186.0             |
| 278             | 39.60                | 57.20           | 83.50           | 174.0            | 31.72           | 49.05                 | 74.34           | 162.5            | 31.59           | 48.60            | 74.83            | 164.0             |
| 279             | 32.14                | 49.53           | 76.15           | 166.0            | 24.80           | 42.00                 | 67.59           | 156.0            | 27.64           | 45.25            | 71.95            | 162.0             |
| 280             | 31.58                | 49.02           | 75.39           | 165.0            | 28.84           | 46.14                 | 71.56           | 160.0            | 31.29           | 48.92            | 75.42            | 165.0             |
| 281             | 21.48                | 37.48           | 62.79           | 152.0            | 24.23           | 39.63                 | 63.70           | 150.8            | 48.22           | 69.82            | 94.00            | 189.0             |
| 282             | NR                   | 70.21           | 88.89           | 180.0            | 26.77           | 43.52                 | 71.79           | 159.0            | 43.30           | 60.50            | 86.52            | 175.0             |
| 283             | 39.19                | 56.69           | 82.89           | 172.0            | 31.52           | 48.59                 | 73.68           | 162.0            | 32.29           | 49.69            | 76.07            | 165.0             |
| 284             | 30.60                | 48.08           | 74.74           | 165.0            | 23.60           | 40.53                 | 65.86           | 154.0            | 27.04           | 44.81            | 71.55            | 161.0             |
| 285             |                      |                 |                 |                  |                 | No zero time          |                 |                  |                 |                  |                  |                   |

TABLE 4-12. TEST 6 TIME OF ARRIVAL DATA (Continued)

| EVENT<br>NUMBER | TIME OF ARRIVAL (ms) |                 |                 |                  |                       |                 |                 |                  |                 |                  |                  |                   |
|-----------------|----------------------|-----------------|-----------------|------------------|-----------------------|-----------------|-----------------|------------------|-----------------|------------------|------------------|-------------------|
|                 | POSITION NUMBER      |                 |                 |                  |                       |                 |                 |                  |                 |                  |                  |                   |
|                 | P1<br>(48.9 ft)      | P2<br>(69.1 ft) | P3<br>(98.3 ft) | P4<br>(199.3 ft) | P5<br>(49.6 ft)       | P6<br>(69.9 ft) | P7<br>(99.2 ft) | P8<br>(199.5 ft) | P9<br>(48.9 ft) | P10<br>(68.7 ft) | P11<br>(98.9 ft) | P12<br>(198.6 ft) |
| 286             | 28.54                | 45.66           | 71.42           | 160.0            | 38.14                 | 55.52           | 81.60           | 169.0            | 34.56           | 51.54            | 78.40            | 167.0             |
| 287             | 33.78                | 51.37           | 77.67           | 167.0            | 30.31                 | 48.06           | 73.65           | 162.0            | 40.23           | 57.87            | 84.45            | 174.0             |
| 288             | 28.66                | 46.14           | 72.31           | 162.0            | 29.15                 | 46.16           | 71.45           | 160.0            | 40.63           | 58.15            | 84.57            | 174.0             |
| 289             | 57.79                | 75.00           | 100.70          | 189.0            | 55.49                 | 73.37           | 100.00          | 188.0            | 8.30            | 24.20            | 49.70            | 137.6             |
| 290             | 37.83                | 55.41           | 81.52           | 171.0            | 26.06                 | 43.24           | 68.63           | 156.5            | 40.20           | 57.61            | 84.00            | 172.5             |
| 291             | 28.21                | 45.62           | 71.40           | 161.0            | 33.69                 | 50.79           | 77.12           | 163.0            | 40.16           | 56.07            | 84.25            | 162.0             |
| 292             | 26.04                | 43.45           | 69.56           | 159.0            | 34.36                 | 51.43           | 76.67           | 165.0            | 44.45           | 61.90            | 88.18            | 177.0             |
| 293             | 37.94                | 55.45           | 81.65           | 171.0            | 30.43                 | 47.87           | 73.32           | 162.0            | 36.27           | 53.67            | 80.07            | 169.5             |
| 294             | 48.46                | 66.04           | 92.50           | 182.0            | 41.92                 | 58.84           | 83.38           | 171.5            | 20.40           | 37.24            | 63.47            | 152.2             |
| 295             | 43.57                | 61.11           | 86.51           | 177.0            | 37.25                 | 54.07           | 79.12           | 165.0            | 27.67           | 45.17            | 71.72            | 161.0             |
| 296             | 28.75                | 45.94           | 71.91           | 160.0            | 29.45                 | 46.59           | 71.80           | 159.0            | 42.40           | 59.93            | 86.38            | 175.5             |
| 297             | 24.14                | 41.09           | 66.91           | 156.0            | 40.41                 | 57.88           | 83.49           | 172.0            | 40.92           | 58.01            | 84.04            | 172.5             |
| 298             | 24.00                | 42.50           | 68.50           | 157.6            | 37.40                 | 68.50           | 78.10           | 168.4            | 37.40           | 54.60            | 80.00            | 167.8             |
| 299             | 36.91                | 53.25           | 78.63           | 167.0            | 15.00                 | 31.50           | 56.27           | 159.0            | 48.47           | 66.04            | 93.00            | 182.0             |
| 300             | 30.06                | 47.38           | 73.37           | 162.5            | 36.28                 | 53.79           | 79.24           | 167.0            | 37.15           | 54.56            | 80.91            | 171.0             |
| 301             | 35.33                | 52.61           | 78.45           | 168.0            | 27.05                 | 44.34           | 69.35           | 157.5            | 42.42           | 60.00            | 86.56            | 176.0             |
| 302             | 51.34                | 68.69           | 95.40           | 184.5            | 38.40                 | 54.82           | 79.20           | 166.0            | 26.60           | 42.78            | 68.47            | 157.0             |
| 303             | 29.11                | 46.04           | 71.62           | 161.0            | 44.26                 | 61.64           | 86.85           | 174.5            | 33.74           | 50.53            | 76.26            | 165.0             |
| 304             | 34.52                | 52.54           | 78.38           | 167.0            | 42.12                 | 59.44           | 84.80           | 172.5            | 32.11           | 49.27            | 75.39            | 164.0             |
| 305             | 24.43                | 41.23           | 66.78           | 172.0            | 30.10                 | 46.64           | 71.37           | 158.5            | 46.39           | 63.85            | 90.19            | 179.0             |
| 306             | 21.51                | 38.56           | 64.29           | 153.2            | 33.88                 | 80.83           | 76.06           | 163.5            | 47.46           | 64.97            | 91.22            | 180.0             |
| 307             | 40.97                | 58.35           | 84.26           | 173.0            | 48.26                 | 66.39           | 92.07           | 180.0            | 28.30           | 45.52            | 71.71            | 160.0             |
| 308             |                      |                 |                 |                  | No separate zero time |                 |                 |                  |                 |                  |                  |                   |
| 309             | 14.00                | 30.00           | 55.77           | 145.0            | 38.11                 | 53.94           | 78.02           | 165.0            | 57.98           | 75.50            | 102.40           | 191.0             |
| 310             | 56.54                | 73.80           | 100.50          | 191.0            | 34.67                 | 50.66           | 75.39           | 162.5            | 31.88           | 47.91            | 73.59            | 162.0             |
| 311             | 43.64                | 60.94           | 86.90           | 176.0            | 44.78                 | 62.06           | 87.59           | 176.0            | 22.39           | 39.71            | 65.95            | 155.0             |
| 312             | 41.40                | 58.87           | 84.99           | 174.0            | 29.83                 | 46.91           | 72.06           | 160.0            | 34.72           | 51.91            | 78.19            | 167.0             |
| 313             | 25.09                | 42.26           | 68.13           | 157.5            | 35.74                 | 52.87           | 78.08           | 166.0            | 42.06           | 59.46            | 85.64            | 174.0             |
| 314             | 28.11                | 45.09           | 71.08           | 160.5            | 45.45                 | 62.94           | 88.50           | 176.5            | 39.92           | 57.25            | 83.22            | 172.0             |
| 315             | 40.22                | 56.85           | 82.24           | 172.0            | 18.50                 | 35.31           | 60.45           | 148.1            | 47.77           | 64.91            | 91.11            | 180.0             |
| 316             | 47.20                | 61.69           | 85.16           | 172.0            | 69.30                 | 86.50           | 112.60          | 201.0            | 23.40           | 36.16            | 59.39            | 146.0             |
| 317             | 21.60                | 37.99           | 63.45           | 152.4            | 48.88                 | 65.87           | 90.95           | 178.5            | 42.54           | 59.08            | 84.94            | 173.0             |
| 318             | 35.05                | 52.34           | 78.32           | 167.0            | 40.83                 | 58.25           | 83.66           | 172.0            | 32.54           | 49.86            | 75.99            | 164.8             |
| 319             | 40.37                | 57.82           | 83.89           | 174.0            | 38.51                 | 55.82           | 81.05           | 169.0            | 28.06           | 45.12            | 71.11            | 159.0             |
| 320             | 40.50                | 58.06           | 84.23           | 174.0            | 31.03                 | 48.35           | 73.61           | 161.0            | 35.17           | 52.28            | 78.43            | 167.0             |
| 321             | 39.17                | 55.70           | 80.83           | 169.0            | 51.68                 | 69.05           | 95.40           | 183.0            | 23.41           | 40.02            | 65.76            | 154.2             |
| 322             | 33.93                | 50.78           | 76.44           | 165.5            | 25.92                 | 43.03           | 68.23           | 156.0            | 47.72           | 65.20            | 91.54            | 180.5             |
| 323             | 29.51                | 46.56           | 72.43           | 161.5            | 28.97                 | 46.18           | 71.51           | 159.5            | 46.23           | 63.86            | 90.27            | 179.8             |
| 324             | 29.51                | 46.56           | 72.43           | 161.5            | 28.97                 | 46.18           | 71.51           | 153.0            | 46.23           | 63.86            | 90.27            | 185.0             |

NR: no useable record

TABLE 4-13. TEST 6 TEMPERATURE DATA

| POSITION IN<br>STACK | BOX<br>NUMBER | DESCRIPTION                         | MAXIMUM<br>TEMPERATURE<br>(°C) |
|----------------------|---------------|-------------------------------------|--------------------------------|
| 2BZ                  | 9             | in projectile                       | 500                            |
| 2BX                  | 3             | in projectile                       | 100                            |
| 2BZ                  | 9             | top of box                          | 135                            |
| 2BX                  | 3             | top of box                          | 980                            |
| 1AY                  | 3             | top of box                          | 700                            |
| 2BZ                  | 13            | in projectile                       | 290                            |
| 2BZ                  | 13            | face of box next to adjacent pallet | 1190                           |
| 2BY                  | 15            | outward face of box                 | 700                            |
| 3BY                  | 13            | outward face of box                 | 1040                           |
|                      |               |                                     |                                |

\*See Figure 3-4 for further description of location

## **CHAPTER 5**

### **ANALYSIS/INTERPRETATION**

Only the data from test 6 will be analyzed further. This is for two reasons. First, because of the large number of events involved, all of the other tests may be interpreted as sub-sets of the test 6 data. Second, test 6 provided true shock time of arrival for each event at each transducer. This allows an estimate of the event location to be made. Once the event location is determined, a yield that is based on its pressure-distance decay characteristics can be determined.

This chapter describes the methodology which was used to estimate each event location. It then presents in both tabular and graphical form the locations determined for each event. The second half of the chapter deals with the determination of yield for each event. It describes the methodology which was applied and then discusses the results which were obtained; i.e., those events which appeared to be high-order detonations (100 percent yield) and those events which were merely propellant reactions (approximately 0.1 percent yield or less).

#### **DETERMINATION OF EVENT LOCATIONS**

An iterative procedure was set up to determine the location of each event. Because the airblast overpressures were quite low, usually below 1 or 2 psi, it was assumed that all signals propagated at sonic velocity. It was further assumed that because of the fire, there was a sound velocity gradient across the ground zero area--with the sound velocity proportional to the ambient temperature.

The analysis procedure works as follows and would be repeated for each event. An arbitrary event location is chosen (usually the center of the ground zero area--coordinates (0,0) ). Arrival times based on sonic velocities are calculated to each gauge position as follows: radial distance between the chosen event location and the known gauge position is divided by the sound velocity. This calculated arrival time is subtracted from the measured arrival time and the resulting difference is squared. This squared difference is summed for all of the gauge positions (P1 through P12). This procedure is repeated until this sum is minimized. The event location which is reported is that location that minimizes this squared difference.

The locations determined for each event are presented in Table 5-1. As a sensitivity check on the procedure, a constant propagation velocity (no fire-induced gradient) was assumed and several of the cases were rerun. The differences in the final locations were not significant. Because of the assumptions which were involved,

it is the author's judgement that the locations presented in Table 5-1 are only accurate to about  $\pm 15$  percent.

The same information presented in Table 5-1 is also presented in Figures 5-1 through 5-3. These are scatter plots showing the locations of the events around the ground zero area. The immediate ground zero area was covered by a 20' x 20' concrete pad. This pad is also shown in the figures, which are simply different views of the same information.

## DETERMINATION OF EVENT YIELDS

Two questions will be addressed in this portion of the report. The first is, "Of those events listed in Table 4-10, which ones were produced by propellant reactions?" The second is, "Which events were true high-order detonations?"

Based on the description of the charge which was presented in Chapter 2, airblast predictions were made using Porzel's Unified Theory of Explosions.<sup>11</sup> Three predictions were made--a 100-percent yield (high-order detonation), a 5-percent yield, and a 0.5-percent yield; these are shown in Figure 5-4. The 100-percent yield represents the predicted curve for the detonation of 4.5 pounds of TNT inside a 105 mm projectile body weighing approximately 24 pounds; the 0.5-percent yield represents the detonation of 0.0225 pound (10 grams) inside the same projectile body. These prediction curves were then used to "calibrate" a yield determination program--DSC.<sup>11</sup> The program DSC was written around concepts and techniques which were developed for the analysis of nuclear blast yields. The program evaluates a pressure-distance curve and produces an absolute yield in megacalories. The data which were presented in Figure 5-4 were run through the DSC program to provide a relationship between absolute yield in megacalories and a relative yield in percent. These relative yields in percent are the yields which are required for this analysis.

The pressure-distance curves generated for each event listed in Table 4-10 were analyzed using the computer program DSC. When an event location was not known, a location was assumed and an approximate pressure-distance curve was generated. The absolute yields which were determined were converted to relative yields and these results tabulated in Table 5-2; the same results are plotted in Figure 5-5.

Based on the numbers of recovered projectiles, it is assumed that 318 projectiles reacted; 324 events were recorded and tabulated. Examining Figure 5-5, the six events with the lowest yields were selected as "propellant" events. All of the selected events had yields of less than 0.10 percent. The six events were events 1, 7, 113, 172, 258, and 282. These six events are plotted with a different symbol in Figure 5-5 and are noted in the comments of Table 5-2.

One event was produced by a high-order detonation with a yield of 100 percent--event 35. This was an event for which there was no zero time. Thus an estimated position was used to make the yield determination.

When the six "propellant" events are excluded, the average yield which was observed was 10 percent. If Figure 5-5 is examined closely, another trend can be discerned. As the event number increases, corresponding to increasing time after the first event or the start of the fire, the yield seems to be increasing. This may be analogous to what is observed in cook-off testing, where slow cook-off tests produce more violent results than do fast cook-off tests.

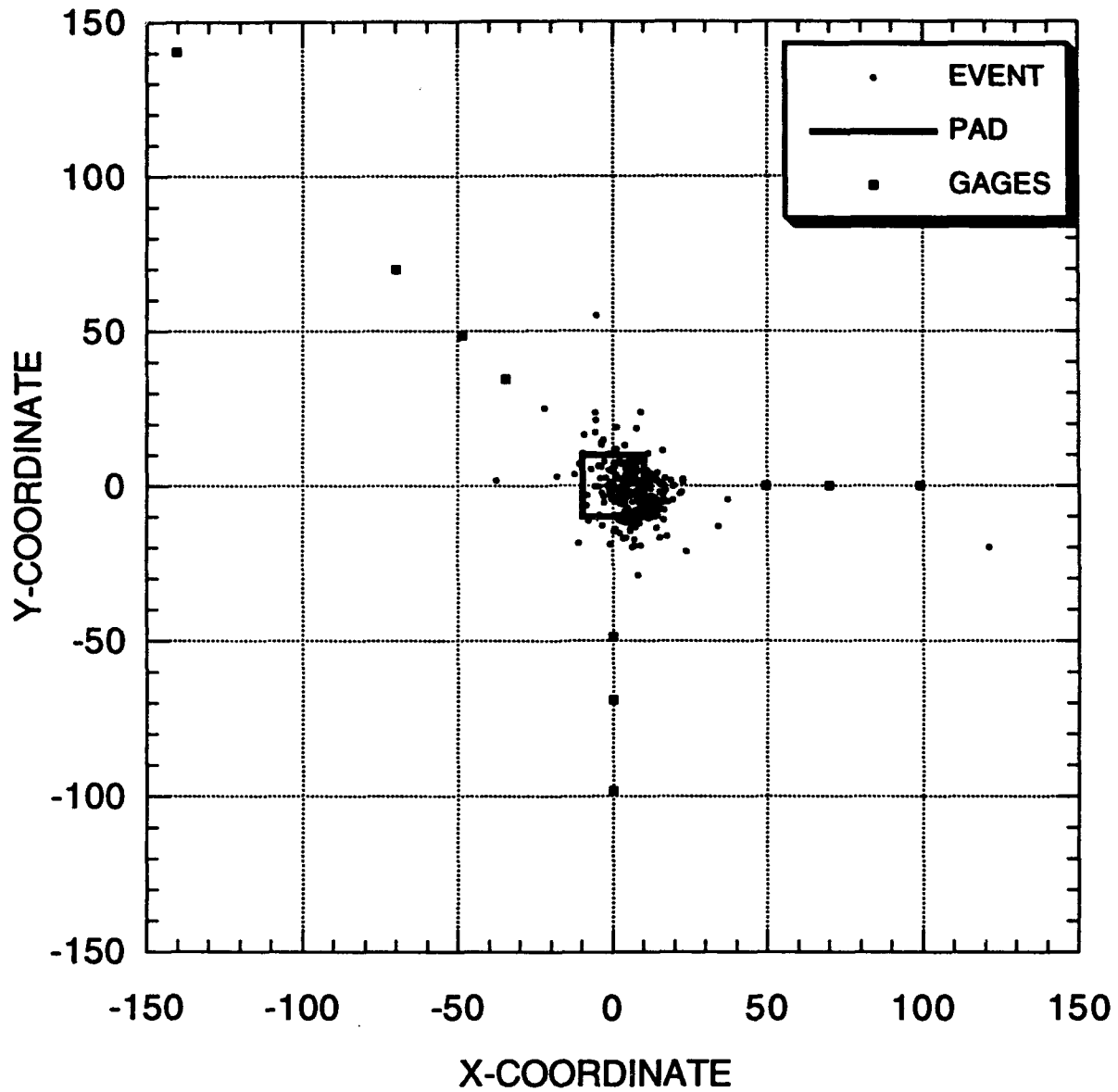


FIGURE 5-1. TEST 6 CALCULATED EVENT LOCATIONS  
(BROAD VIEW)

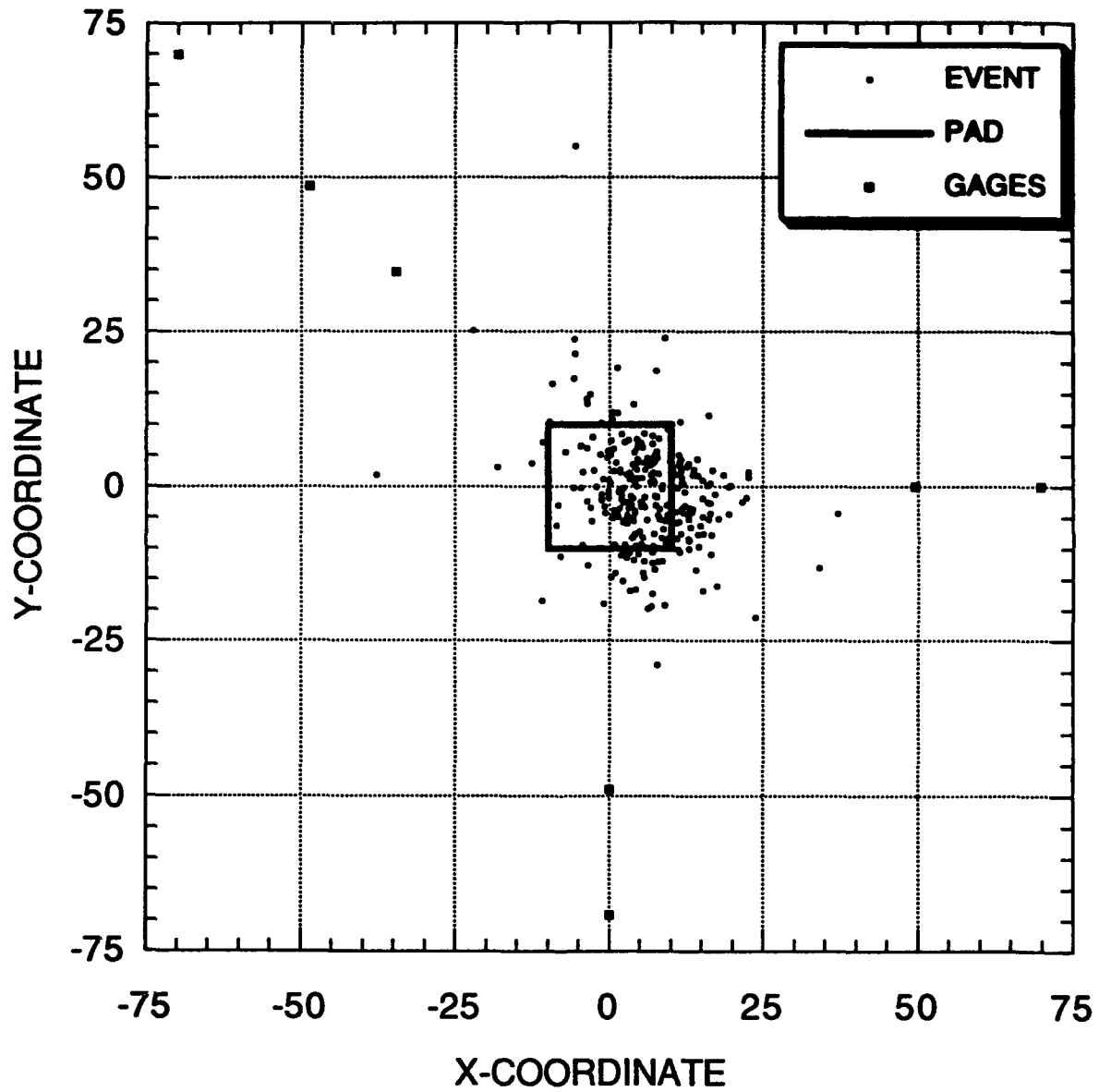


FIGURE 5-2. TEST 6 CALCULATED EVENT LOCATIONS  
(INTERMEDIATE VIEW)

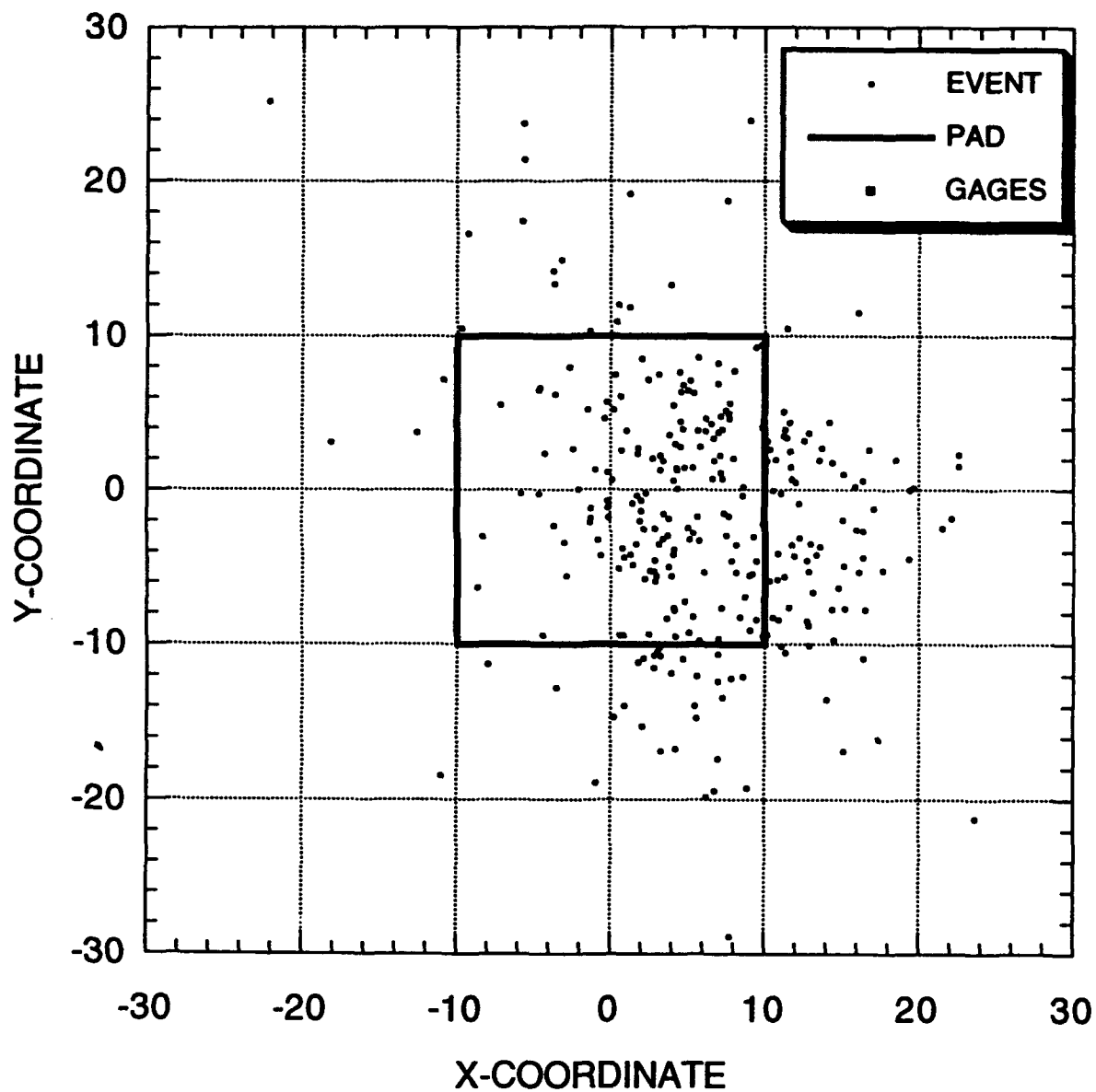


FIGURE 5-3. TEST 6 CALCULATED EVENT LOCATIONS  
(NARROW VIEW)

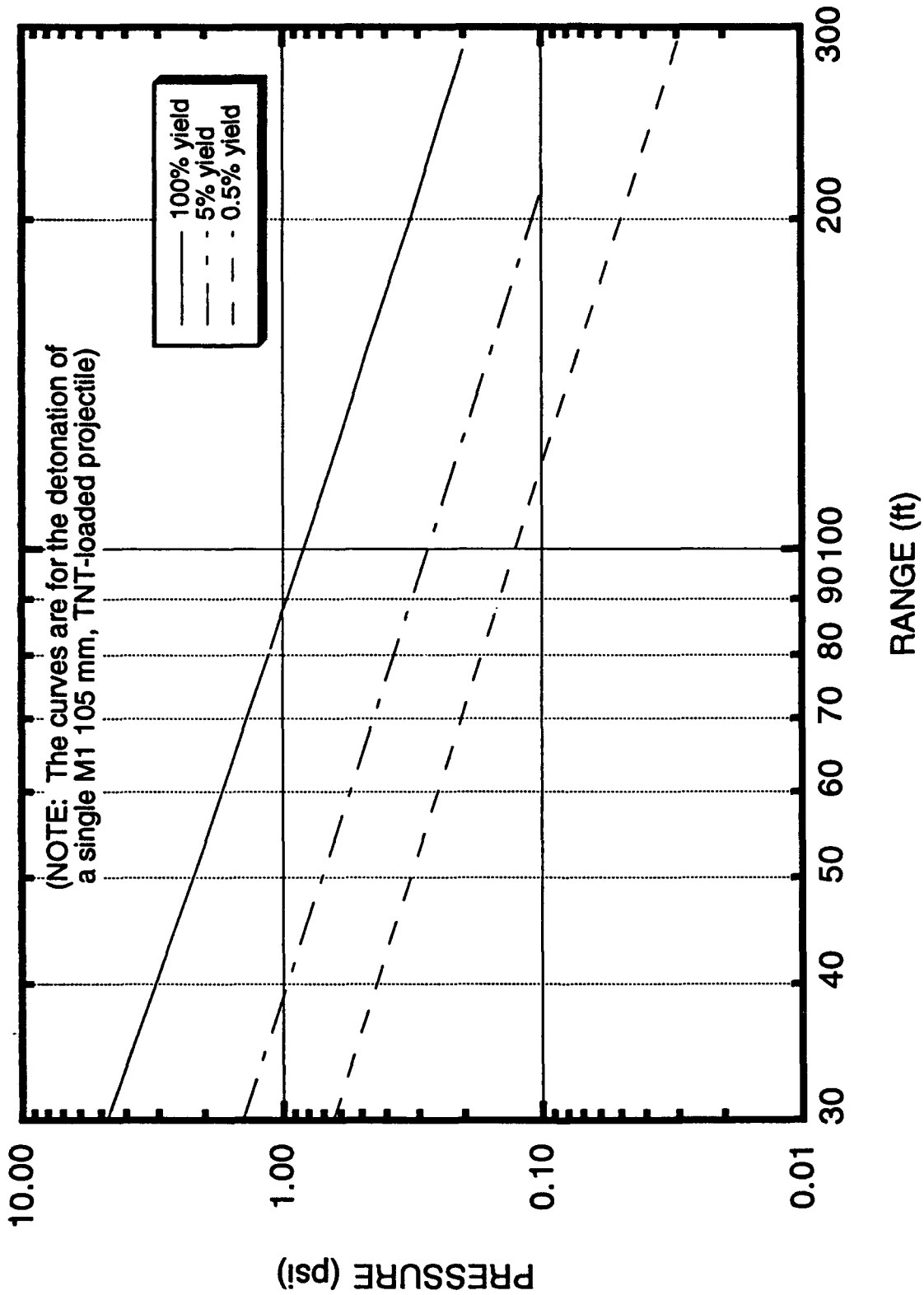


FIGURE 5-4. PREDICTED PRESSURE-DISTANCE CURVES

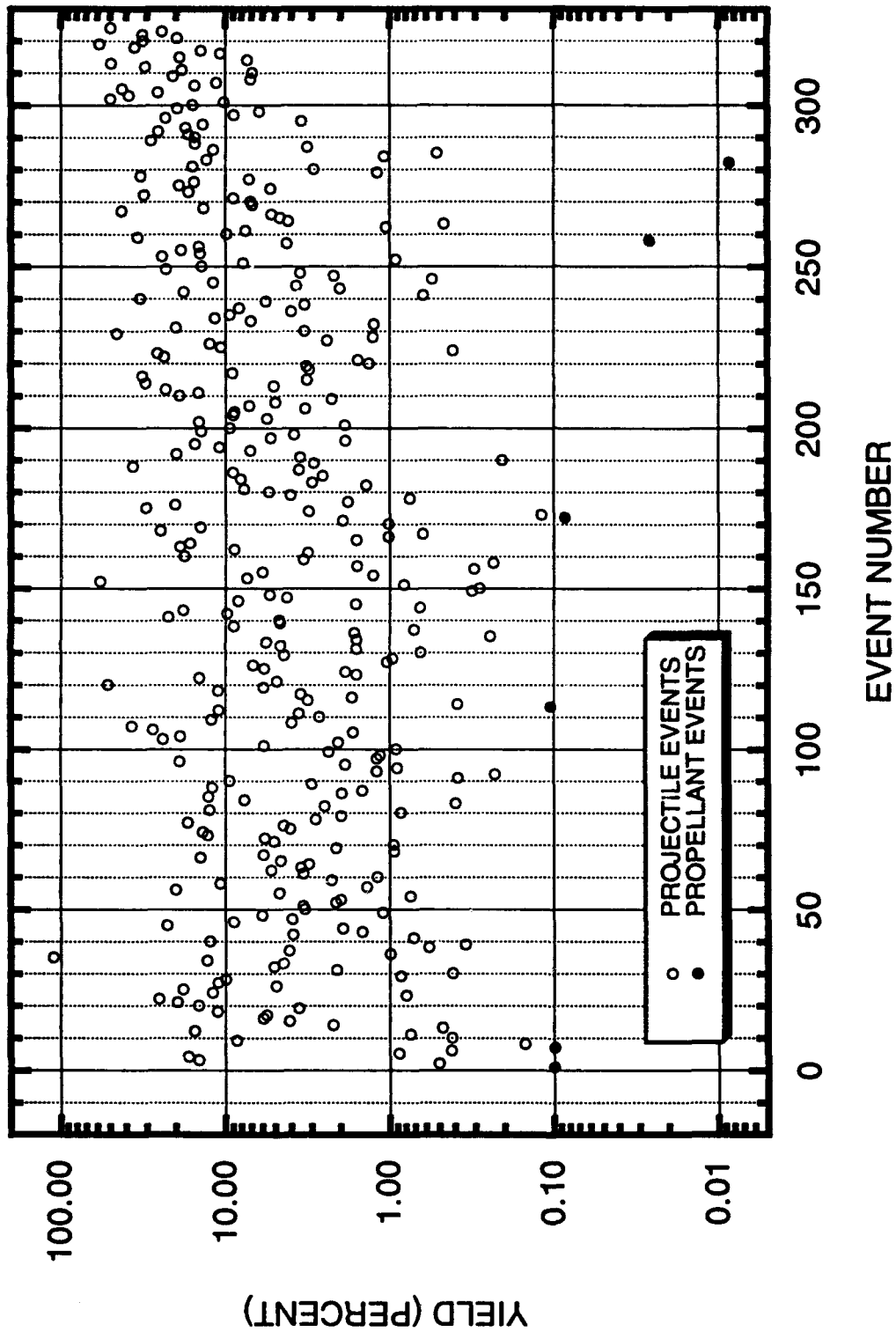


FIGURE 5-5. EVENT 6 YIELD ANALYSIS

TABLE 5-1. TEST 6 CALCULATED EVENT LOCATIONS

| Event Number | Digital Record Number | COORDINATES* |         |
|--------------|-----------------------|--------------|---------|
|              |                       | X0 (ft)      | Y0 (ft) |
| 1            | 1                     | 2.0          | -1.4    |
| 2            | 2                     | -0.2         | -1.1    |
| 3            | 3                     | 8.0          | 2.0     |
| 4            | 3A                    | NZT          | NZT     |
| 5            | 4                     | -0.2         | 1.1     |
| 6            | 5                     | 7.3          | 0.7     |
| 7            | 6                     | 11.1         | -0.2    |
| 8            | 7                     | 3.4          | -3.2    |
| 9            | 8                     | 13.3         | -4.2    |
| 10           | 9                     | 1.0          | 3.9     |
| 11           | 10                    | 0.7          | 2.5     |
| 12           | 11                    | 10.4         | 2.6     |
| 13           | 12                    | 3.1          | -3.5    |
| 14           | 13                    | -0.2         | -0.7    |
| 15           | 14                    | 15.1         | -1.9    |
| 16           | 15                    | -3.7         | -2.3    |
| 17           | 16                    | 3.8          | -1.9    |
| 18           | 17                    | 11.7         | -3.5    |
| 19           | 18                    | 6.2          | 3.8     |
| 20           | 19                    | -0.1         | -1.8    |
| 21           | 20                    | 11.9         | -4.2    |
| 22           | 20A                   | NZT          | NZT     |
| 23           | 21                    | 4.2          | 3.0     |
| 24           | 22                    | 10.5         | 0.0     |
| 25           | 22A                   | NZT          | NZT     |
| 26           | 23                    | 7.8          | -12.2   |
| 27           | 23A                   | NZT          | NZT     |
| 28           | 24                    | -1.3         | -1.9    |
| 29           | 25                    | 0.1          | 0.7     |
| 30           | 26                    | -1.0         | 1.3     |
| 31           | 27                    | -3.6         | 6.2     |
| 32           | 28                    | 3.2          | -10.8   |
| 33           | 29                    | 6.7          | 3.3     |
| 34           | 30                    | 16.3         | 0.6     |
| 35           | 30A                   | NZT          | NZT     |
| 36           | 31                    | -4.6         | 6.6     |
| 37           | 32                    | 1.4          | -0.9    |
| 38           | 33                    | 2.9          | -2.5    |
| 39           | 33A                   | NZT          | NZT     |
| 40           | 34                    | 10.8         | -5.8    |
| 41           | 35                    | 0.9          | -9.5    |
| 42           | 36                    | -3.1         | -3.4    |
| 43           | 37                    | 4.5          | 2.8     |
| 44           | 38                    | 3.2          | -10.2   |
| 45           | 39                    | 6.7          | 1.9     |
| 46           | 40                    | 7.0          | -9.7    |
| 47           | 41                    | 8.6          | -12.1   |
| 48           | 42                    | 11.6         | -7.6    |
| 49           | 43                    | 3.5          | -1.6    |
| 50           | 44                    | 7.5          | -3.0    |
| 51           | 44A                   | NZT          | NZT     |
| 52           | 45                    | 2.8          | -5.3    |
| 53           | 45A                   | NZT          | NZT     |
| 54           | 46                    | 4.1          | -7.8    |
| 55           | 47                    | -7.1         | 5.5     |
| 56           | 48                    | 13.6         | -3.7    |
| 57           | 49                    | 5.1          | -3.2    |
| 58           | 50                    | 9.9          | -2.3    |
| 59           | 51                    | 0.7          | -3.8    |
| 60           | 52                    | 5.1          | -9.3    |
| 61           | 52A                   | NZT          | NZT     |
| 62           | 53                    | 7.3          | -13.4   |
| 63           | 53A                   | NZT          | NZT     |
| 64           | 54                    | 1.8          | 2.7     |
| 65           | 55                    | 121.0        | -19.9   |
| 66           | 56                    | 3.8          | 3.6     |
| 67           | 57                    | -1.3         | -2.1    |
| 68           | 58                    | 0.8          | -4.4    |
| 69           | 59                    | 8.6          | 0.2     |
| 70           | 60                    | 1.4          | -4.9    |
| 71           | 61                    | 9.4          | -4.6    |
| 72           | 62                    | 16.4         | -4.4    |
| 73           | 63                    | 5.2          | 7.1     |
| 74           | 64                    | -2.5         | 2.7     |
| 75           | 65                    | -10.8        | 7.2     |
| 76           | 66                    | 13.0         | -3.5    |
| 77           | 67                    | 2.8          | -4.6    |
| 78           | 68                    | 9.1          | -9.1    |
| 79           | 69                    | 2.8          | -10.7   |
| 80           | 70                    | 4.2          | -16.7   |
| 81           | 71                    | 7.0          | -12.4   |
| 82           | 72                    | 3.9          | -5.6    |
| 83           | 73                    | 2.2          | -2.5    |
| 84           | 74                    | 12.9         | -10.1   |
| 85           | 74A                   | NZT          | NZT     |
| 86           | 75                    | 4.3          | 1.3     |
| 87           | 76                    | 17.6         | -5.2    |
| 88           | 76A                   | NZT          | NZT     |
| 89           | 77                    | 5.7          | 3.9     |
| 90           | 78                    | -1.5         | 5.2     |
| 91           | 79                    | 2.0          | -2.0    |
| 92           | 79A                   | NZT          | NZT     |
| 93           | 80                    | 3.3          | -16.9   |
| 94           | 80A                   | NZT          | NZT     |
| 95           | 81                    | 7.8          | 4.6     |
| 96           | 82                    | 13.6         | 1.9     |
| 97           | 83                    | 3.9          | -11.8   |
| 98           | 83A                   | NZT          | NZT     |
| 99           | 84                    | 3.2          | 1.3     |
| 100          | 85                    | 2.3          | -0.2    |

TABLE 5-1. TEST 6 CALCULATED EVENT LOCATIONS (Continued)

| Event Number | Digital Record Number | COORDINATES* |         |
|--------------|-----------------------|--------------|---------|
|              |                       | X0 (ft)      | Y0 (ft) |
| 101          | 86                    | 13.7         | 2.7     |
| 102          | 87                    | 5.4          | -14.0   |
| 103          | 88                    | 11.4         | 3.4     |
| 104          | 89                    | 9.9          | 4.0     |
| 105          | 90                    | 0.6          | -9.4    |
| 106          | 91                    | -4.3         | 2.4     |
| 107          | 92                    | 1.7          | -0.4    |
| 108          | 93                    | 0.2          | 5.2     |
| 109          | 94                    | -0.8         | -3.2    |
| 110          | 95                    | 10.2         | -9.3    |
| 111          | 96                    | 5.7          | -9.8    |
| 112          | 97                    | 10.8         | 2.0     |
| 113          | 98                    | 2.8          | -11.5   |
| 114          | 98A                   | NZT          | NZT     |
| 115          | 99                    | 4.1          | 5.5     |
| 116          | 100                   | 5.6          | -14.8   |
| 117          | 101                   | 3.2          | 2.2     |
| 118          | 102                   | 3.8          | -5.0    |
| 119          | 103                   | 2.1          | -15.3   |
| 120          | 104                   | 4.1          | -4.2    |
| 121          | 105                   | 7.7          | 5.6     |
| 122          | 106                   | 4.2          | -9.5    |
| 123          | 107                   | 10.3         | -5.9    |
| 124          | 108                   | 14.2         | 4.4     |
| 125          | 109                   | 0.7          | 6.1     |
| 126          | 110                   | 16.4         | -10.9   |
| 127          | 111                   | 15.1         | 1.0     |
| 128          | 112                   | 5.7          | 8.6     |
| 129          | 113                   | NZT          | NZT     |
| 130          | 114                   | 4.1          | 0.6     |
| 131          | 115                   | 8.1          | -3.6    |
| 132          | 116                   | 12.0         | 0.5     |
| 133          | 117                   | -3.2         | 14.9    |
| 134          | 118                   | 3.4          | 1.9     |
| 135          | 119                   | 1.8          | 2.3     |
| 136          | 120                   | 1.6          | -3.5    |
| 137          | 120A                  | NZT          | NZT     |
| 138          | 121                   | 11.3         | 3.9     |
| 139          | 122                   | 7.2          | -7.7    |
| 140          | 123                   | 2.0          | -0.7    |
| 141          | 124                   | -1.3         | -1.2    |
| 142          | 125                   | 3.2          | 7.5     |
| 143          | 126                   | 3.7          | -2.9    |
| 144          | 127                   | 5.4          | 6.3     |
| 145          | 128                   | -5.5         | 55.1    |
| 146          | 129                   | -8.3         | -3.0    |
| 147          | 130                   | 11.3         | -5.6    |
| 148          | 131                   | 12.2         | -3.1    |
| 149          | 132                   | 4.4          | 0.1     |
| 150          | 132A                  | NZT          | NZT     |
| 151          | 133                   | 4.7          | 6.8     |
| 152          | 134                   | 11.8         | 0.7     |
| 153          | 135                   | 14.4         | 1.8     |
| 154          | 136                   | 6.0          | -5.4    |
| 155          | 137                   | 11.1         | -10.1   |
| 156          | 138                   | 5.0          | -2.4    |
| 157          | 139                   | 5.3          | 1.4     |
| 158          | 139A                  | NZT          | NZT     |
| 159          | 140                   | 11.3         | 3.5     |
| 160          | 141                   | 16.8         | 2.6     |
| 161          | 142                   | 17.1         | -1.2    |
| 162          | 142A                  | NZT          | NZT     |
| 163          | 143                   | 11.7         | 2.5     |
| 164          | 144                   | 9.8          | 9.4     |
| 165          | 145                   | 9.3          | -3.0    |
| 166          | 146                   | 15.2         | -7.7    |
| 167          | 146A                  | NZT          | NZT     |
| 168          | 147                   | -1.4         | 10.3    |
| 169          | 148                   | 7.1          | 1.1     |
| 170          | 149                   | 10.9         | -4.1    |
| 171          | 150                   | 10.2         | 1.9     |
| 172          | 151                   | 11.7         | 4.4     |
| 173          | 151A                  | NZT          | NZT     |
| 174          | 152                   | 3.9          | 13.3    |
| 175          | 153                   | 4.6          | 4.5     |
| 176          | 154                   | 16.4         | -2.7    |
| 177          | 155                   | 4.6          | 6.4     |
| 178          | 156                   | 7.4          | -1.5    |
| 179          | 157                   | 19.7         | 0.1     |
| 180          | 158                   | 21.5         | -2.5    |
| 181          | 159                   | NZT          | NZT     |
| 182          | 160                   | 9.5          | 9.3     |
| 183          | 161                   | 7.0          | 8.2     |
| 184          | 162                   | 1.8          | -11.2   |
| 185          | 163                   | 2.5          | 7.2     |
| 186          | 164                   | 11.4         | -10.5   |
| 187          | 165                   | 7.0          | -10.6   |
| 188          | 166                   | -3.6         | 13.4    |
| 189          | 167                   | 9.5          | -8.4    |
| 190          | 168                   | 6.6          | 0.7     |
| 191          | 169                   | 2.1          | 8.5     |
| 192          | 170                   | 7.0          | -17.4   |
| 193          | 171                   | 0.3          | 7.5     |
| 194          | 172                   | 19.4         | 0.0     |
| 195          | 173                   | -9.3         | 16.6    |
| 196          | 174                   | 12.7         | -4.6    |
| 197          | 175                   | -0.3         | 5.7     |
| 198          | 176                   | 5.4          | -8.2    |
| 199          | 177                   | 6.2          | -19.8   |
| 200          | 178                   | 5.7          | -3.3    |

TABLE 5-1. TEST 6 CALCULATED EVENT LOCATIONS (Continued)

| Event Number | Digital Record Number | COORDINATES* |         |
|--------------|-----------------------|--------------|---------|
|              |                       | X0 (ft)      | Y0 (ft) |
| 201          | 179                   | 11.3         | 5.1     |
| 202          | 180                   | 12.9         | 3.7     |
| 203          | 181                   | 12.8         | -8.5    |
| 204          | 182                   | 2.5          | -9.4    |
| 205          | 183                   | 16.1         | -5.3    |
| 206          | 184                   | 14.4         | -7.8    |
| 207          | 185                   | 6.2          | 4.6     |
| 208          | 186                   | -0.7         | -4.3    |
| 209          | 187                   | 10.2         | 3.2     |
| 210          | 188                   | 22.6         | 1.5     |
| 211          | 189                   | 3.0          | -10.5   |
| 212          | 190                   | 11.4         | 10.5    |
| 213          | 191                   | 4.1          | -7.7    |
| 214          | 192                   | 1.3          | 11.9    |
| 215          | 193                   | 9.9          | -2.2    |
| 216          | 194                   | 0.2          | -14.7   |
| 217          | 195                   | 2.2          | -5.8    |
| 218          | 196                   | 5.8          | 2.8     |
| 219          | 196A                  | NZT          | NZT     |
| 220          | 197                   | 4.1          | -3.8    |
| 221          | 198                   | NZT          | NZT     |
| 222          | 199                   | 37.1         | -4.3    |
| 223          | 200                   | 5.7          | -1.7    |
| 224          | 201                   | 6.8          | -19.4   |
| 225          | 202                   | 18.5         | 1.9     |
| 226          | 202A                  | NZT          | NZT     |
| 227          | 203                   | 0.9          | -14.0   |
| 228          | 203A                  | NZT          | NZT     |
| 229          | 204                   | -5.6         | 21.4    |
| 230          | 205                   | 7.8          | -4.6    |
| 231          | 206                   | 14.8         | -6.3    |
| 232          | 207                   | 8.6          | -0.4    |
| 233          | 208                   | 7.6          | 18.7    |
| 234          | 208A                  | NZT          | NZT     |
| 235          | 209                   | 7.7          | 5.0     |
| 236          | 210                   | 13.1         | -6.6    |
| 237          | 211                   | 9.9          | -9.5    |
| 238          | 212                   | NZT          | NZT     |
| 239          | 213                   | 14.0         | -13.5   |
| 240          | 214                   | 8.4          | -8.3    |
| 241          | 215                   | 16.6         | -7.8    |
| 242          | 216                   | 16.0         | -2.6    |
| 243          | 217                   | 7.2          | 4.8     |
| 244          | 218                   | 4.7          | 4.0     |
| 245          | 219                   | 5.6          | -12.0   |
| 246          | 220                   | NZT          | NZT     |
| 247          | 221                   | 9.0          | -5.5    |
| 248          | 222                   | NZT          | NZT     |
| 249          | 223                   | 14.5         | -9.7    |
| 250          | 224                   | -3.7         | 14.2    |
| 251          | 225                   | 11.7         | 1.5     |
| 252          | 226                   | NZT          | NZT     |
| 253          | 227                   | 0.5          | 12.0    |
| 254          | 228                   | -5.7         | 23.7    |
| 255          | 229                   | 4.9          | -7.2    |
| 256          | 230                   | 15.9         | 0.2     |
| 257          | 231                   | 4.3          | 1.4     |
| 258          | 232                   | 23.6         | -21.2   |
| 259          | 233                   | 7.5          | 5.2     |
| 260          | 234                   | 15.1         | -16.9   |
| 261          | 235                   | 19.3         | -4.5    |
| 262          | 236                   | 2.7          | 2.0     |
| 263          | 236A                  | NZT          | NZT     |
| 264          | 237                   | 12.9         | -5.3    |
| 265          | 238                   | 10.0         | 2.8     |
| 266          | 239                   | 3.7          | -8.4    |
| 267          | 240                   | -0.4         | 4.7     |
| 268          | 241                   | 34.0         | -13.1   |
| 269          | 242                   | 2.9          | -5.9    |
| 270          | 243                   | 7.1          | 2.2     |
| 271          | 244                   | 1.3          | -4.2    |
| 272          | 245                   | -4.6         | 6.5     |
| 273          | 246                   | -2.1         | 0.0     |
| 274          | 247                   | 9.2          | -5.4    |
| 275          | 248                   | 5.3          | -2.8    |
| 276          | 249                   | 3.0          | -5.6    |
| 277          | 250                   | 8.9          | -19.2   |
| 278          | 251                   | 4.5          | 7.7     |
| 279          | 252                   | 6.6          | 4.3     |
| 280          | 253                   | 4.8          | 1.4     |
| 281          | 254                   | 17.4         | -16.1   |
| 282          | 255                   | 16.1         | 11.5    |
| 283          | 256                   | 5.0          | 6.5     |
| 284          | 257                   | 7.3          | 3.9     |
| 285          | 258                   | NZT          | NZT     |
| 286          | 259                   | -2.9         | -5.6    |
| 287          | 260                   | 7.7          | -1.7    |
| 288          | 261                   | 8.1          | -5.3    |
| 289          | 262                   | 2.2          | 25.2    |
| 290          | 263                   | 12.6         | 3.2     |
| 291          | 264                   | 2.5          | -5.2    |
| 292          | 265                   | 4.7          | -10.9   |
| 293          | 266                   | 7.0          | 3.8     |
| 294          | 267                   | -5.8         | 17.4    |
| 295          | 268                   | 0.4          | 10.9    |
| 296          | 269                   | 8.7          | -6.9    |
| 297          | 270                   | -3.5         | -12.8   |
| 298          | 271                   | -4.4         | -9.4    |
| 299          | 272                   | 22.2         | -1.8    |
| 300          | 273                   | 0.5          | -5.1    |

TABLE 5-1. TEST 6 CALCULATED EVENT LOCATIONS (Continued)

| Event<br>Number | Digital<br>Record<br>Number | COORDINATES* |            |
|-----------------|-----------------------------|--------------|------------|
|                 |                             | X0<br>(ft)   | Y0<br>(ft) |
| 301             | 274                         | 12.2         | -0.8       |
| 302             | 275                         | 1.3          | 19.2       |
| 303             | 276                         | -8.7         | -6.3       |
| 304             | 277                         | -5.8         | -0.2       |
| 305             | 278                         | 10.5         | -8.3       |
| 306             | 279                         | -0.9         | -18.9      |
| 307             | 280                         | -12.6        | 3.7        |
| 308             | 280A                        | NZT          | NZT        |
| 309             | 281                         | 7.8          | -28.9      |
| 310             | 282                         | 9.0          | 23.9       |
| 311             | 283                         | -9.7         | 10.5       |
| 312             | 284                         | 8.1          | 7.7        |
| 313             | 285                         | 2.1          | -10.9      |
| 314             | 286                         | -8.0         | -11.3      |
| 315             | 287                         | 22.6         | 2.3        |
| 316             | 288                         | -37.7        | 1.9        |
| 317             | 289                         | -11.0        | -18.5      |
| 318             | 290                         | -4.7         | -0.2       |
| 319             | 291                         | -2.7         | 8.0        |
| 320             | 292                         | 7.0          | 6.9        |
| 321             | 293                         | -18.1        | 3.1        |
| 322             | 294                         | 15.1         | -4.9       |
| 323             | 295                         | 10.9         | -8.4       |
| 324             | 296                         | 12.9         | -8.8       |

NZT: no zero time

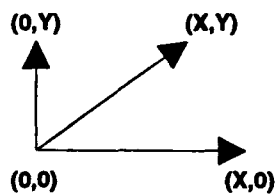


TABLE 5-2. TEST 6 EVENT YIELDS

| EVENT<br>NUMBER | YIELD<br>(%) | COMMENTS              | EVENT<br>NUMBER | YIELD<br>(%) | COMMENTS |
|-----------------|--------------|-----------------------|-----------------|--------------|----------|
| 1               | 0.10         | Propellant Event      | 51              | 3.36         |          |
| 2               | 0.50         |                       | 52              | 2.12         |          |
| 3               | 14.54        |                       | 53              | 1.98         |          |
| 4               | 16.81        |                       | 54              | 0.75         |          |
| 5               | 0.87         |                       | 55              | 4.71         |          |
| 6               | 0.42         |                       | 56              | 20.01        |          |
| 7               | 0.10         | Propellant Event      | 57              | 1.37         |          |
| 8               | 0.15         |                       | 58              | 10.77        |          |
| 9               | 8.50         |                       | 59              | 2.26         |          |
| 10              | 0.42         |                       | 60              | 1.19         |          |
| 11              | 0.74         |                       | 61              | 3.36         |          |
| 12              | 15.40        |                       | 62              | 5.27         |          |
| 13              | 0.47         |                       | 63              | 3.48         |          |
| 14              | 2.22         |                       | 64              | 3.11         |          |
| 15              | 4.07         |                       | 65              | 4.62         |          |
| 16              | 5.89         |                       | 66              | 14.25        |          |
| 17              | 5.62         |                       | 67              | 5.89         |          |
| 18              | 11.22        |                       | 68              | 0.94         |          |
| 19              | 3.57         |                       | 69              | 2.13         |          |
| 20              | 14.55        |                       | 70              | 0.94         |          |
| 21              | 19.61        |                       | 71              | 5.06         |          |
| 22              | 25.25        |                       | 72              | 5.81         |          |
| 23              | 0.79         |                       | 73              | 12.88        |          |
| 24              | 12.03        |                       | 74              | 13.84        |          |
| 25              | 18.11        |                       | 75              | 4.04         |          |
| 26              | 4.95         |                       | 76              | 4.45         |          |
| 27              | 11.10        |                       | 77              | 17.04        |          |
| 28              | 9.99         |                       | 78              | 2.85         |          |
| 29              | 0.86         |                       | 79              | 1.98         |          |
| 30              | 0.41         |                       | 80              | 0.86         |          |
| 31              | 2.11         |                       | 81              | 12.54        |          |
| 32              | 5.09         |                       | 82              | 2.50         |          |
| 33              | 4.43         |                       | 83              | 0.40         |          |
| 34              | 12.92        |                       | 84              | 7.73         |          |
| 35              | 110.64       | High Order Detonation | 85              | 12.79        |          |
| 36              | 0.99         |                       | 86              | 1.97         |          |
| 37              | 4.11         |                       | 87              | 1.48         |          |
| 38              | 0.58         |                       | 88              | 12.09        |          |
| 39              | 0.35         |                       | 89              | 3.00         |          |
| 40              | 12.52        |                       | 90              | 9.44         |          |
| 41              | 0.72         |                       | 91              | 0.38         |          |
| 42              | 3.91         |                       | 92              | 0.23         |          |
| 43              | 1.48         |                       | 93              | 1.20         |          |
| 44              | 1.93         |                       | 94              | 0.90         |          |
| 45              | 22.82        |                       | 95              | 1.87         |          |
| 46              | 8.97         |                       | 96              | 18.91        |          |
| 47              | 3.93         |                       | 97              | 1.19         |          |
| 48              | 5.97         |                       | 98              | 1.14         |          |
| 49              | 1.10         |                       | 99              | 2.35         |          |
| 50              | 3.29         |                       | 100             | 0.91         |          |

TABLE 5-2. TEST 6 EVENT YIELDS (Continued)

| EVENT<br>NUMBER | YIELD<br>(%) | COMMENTS         | EVENT<br>NUMBER | YIELD<br>(%) | COMMENTS         |
|-----------------|--------------|------------------|-----------------|--------------|------------------|
| 101             | 5.84         |                  | 151             | 0.82         |                  |
| 102             | 2.07         |                  | 152             | 57.76        |                  |
| 103             | 23.96        |                  | 153             | 7.41         |                  |
| 104             | 18.75        |                  | 154             | 1.27         |                  |
| 105             | 1.68         |                  | 155             | 5.95         |                  |
| 106             | 27.44        |                  | 156             | 0.31         |                  |
| 107             | 37.12        |                  | 157             | 1.58         |                  |
| 108             | 3.96         |                  | 158             | 0.23         |                  |
| 109             | 12.17        |                  | 159             | 3.37         |                  |
| 110             | 2.68         |                  | 160             | 17.80        |                  |
| 111             | 3.57         |                  | 161             | 3.15         |                  |
| 112             | 10.99        |                  | 162             | 8.84         |                  |
| 113             | 0.10         | Propellant Event | 163             | 18.99        |                  |
| 114             | 0.39         |                  | 164             | 16.50        |                  |
| 115             | 3.14         |                  | 165             | 1.59         |                  |
| 116             | 1.70         |                  | 166             | 1.02         |                  |
| 117             | 3.50         |                  | 167             | 0.63         |                  |
| 118             | 11.16        |                  | 168             | 24.81        |                  |
| 119             | 5.88         |                  | 169             | 14.31        |                  |
| 120             | 51.52        |                  | 170             | 1.02         |                  |
| 121             | 4.88         |                  | 171             | 1.94         |                  |
| 122             | 14.45        |                  | 172             | 0.09         | Propellant Event |
| 123             | 1.60         |                  | 173             | 0.12         |                  |
| 124             | 1.86         |                  | 174             | 3.13         |                  |
| 125             | 5.83         |                  | 175             | 30.33        |                  |
| 126             | 6.85         |                  | 176             | 20.19        |                  |
| 127             | 1.04         |                  | 177             | 1.80         |                  |
| 128             | 0.96         |                  | 178             | 0.75         |                  |
| 129             | 4.43         |                  | 179             | 4.03         |                  |
| 130             | 0.65         |                  | 180             | 5.42         |                  |
| 131             | 1.59         |                  | 181             | 7.74         |                  |
| 132             | 4.63         |                  | 182             | 1.38         |                  |
| 133             | 5.65         |                  | 183             | 2.98         |                  |
| 134             | 1.60         |                  | 184             | 8.07         |                  |
| 135             | 0.24         |                  | 185             | 2.55         |                  |
| 136             | 1.65         |                  | 186             | 9.05         |                  |
| 137             | 0.71         |                  | 187             | 3.56         |                  |
| 138             | 8.97         |                  | 188             | 36.37        |                  |
| 139             | 4.68         |                  | 189             | 2.89         |                  |
| 140             | 4.73         |                  | 190             | 0.20         |                  |
| 141             | 22.32        |                  | 191             | 3.53         |                  |
| 142             | 9.80         |                  | 192             | 19.93        |                  |
| 143             | 18.16        |                  | 193             | 7.08         |                  |
| 144             | 0.65         |                  | 194             | 10.92        |                  |
| 145             | 1.62         |                  | 195             | 15.41        |                  |
| 146             | 8.45         |                  | 196             | 1.87         |                  |
| 147             | 4.26         |                  | 197             | 5.30         |                  |
| 148             | 5.39         |                  | 198             | 3.86         |                  |
| 149             | 0.31         |                  | 199             | 14.13        |                  |
| 150             | 0.28         |                  | 200             | 9.45         |                  |

TABLE 5-2. TEST 6 EVENT YIELDS (Continued)

| EVENT<br>NUMBER | YIELD<br>(%) | COMMENTS | EVENT<br>NUMBER | YIELD<br>(%) | COMMENTS         |
|-----------------|--------------|----------|-----------------|--------------|------------------|
| 201             | 1.88         |          | 251             | 7.80         |                  |
| 202             | 14.56        |          | 252             | 0.92         |                  |
| 203             | 5.62         |          | 253             | 24.39        |                  |
| 204             | 9.00         |          | 254             | 14.37        |                  |
| 205             | 8.88         |          | 255             | 18.67        |                  |
| 206             | 3.29         |          | 256             | 14.54        |                  |
| 207             | 7.15         |          | 257             | 4.23         |                  |
| 208             | 4.99         |          | 258             | 0.03         | Propellant Event |
| 209             | 2.26         |          | 259             | 34.04        |                  |
| 210             | 19.16        |          | 260             | 9.81         |                  |
| 211             | 14.74        |          | 261             | 7.55         |                  |
| 212             | 23.14        |          | 262             | 1.05         |                  |
| 213             | 5.11         |          | 263             | 0.47         |                  |
| 214             | 30.72        |          | 264             | 4.14         |                  |
| 215             | 3.21         |          | 265             | 4.67         |                  |
| 216             | 31.82        |          | 266             | 5.24         |                  |
| 217             | 9.10         |          | 267             | 42.51        |                  |
| 218             | 3.10         |          | 268             | 13.60        |                  |
| 219             | 3.21         |          | 269             | 6.88         |                  |
| 220             | 1.34         |          | 270             | 7.00         |                  |
| 221             | 1.56         |          | 271             | 8.93         |                  |
| 222             | 23.71        |          | 272             | 31.32        |                  |
| 223             | 25.87        |          | 273             | 16.78        |                  |
| 224             | 0.41         |          | 274             | 5.31         |                  |
| 225             | 10.70        |          | 275             | 19.22        |                  |
| 226             | 12.44        |          | 276             | 15.54        |                  |
| 227             | 2.42         |          | 277             | 7.16         |                  |
| 228             | 1.26         |          | 278             | 32.81        |                  |
| 229             | 45.50        |          | 279             | 1.19         |                  |
| 230             | 3.32         |          | 280             | 2.90         |                  |
| 231             | 20.10        |          | 281             | 15.82        |                  |
| 232             | 1.25         |          | 282             | 0.01         | Propellant Event |
| 233             | 7.06         |          | 283             | 13.06        |                  |
| 234             | 11.69        |          | 284             | 1.08         |                  |
| 235             | 9.48         |          | 285             | 0.51         |                  |
| 236             | 3.99         |          | 286             | 11.92        |                  |
| 237             | 8.25         |          | 287             | 3.18         |                  |
| 238             | 3.30         |          | 288             | 15.36        |                  |
| 239             | 5.72         |          | 289             | 28.29        |                  |
| 240             | 32.94        |          | 290             | 15.37        |                  |
| 241             | 0.62         |          | 291             | 16.95        |                  |
| 242             | 17.96        |          | 292             | 25.62        |                  |
| 243             | 2.02         |          | 293             | 17.60        |                  |
| 244             | 3.71         |          | 294             | 13.77        |                  |
| 245             | 11.91        |          | 295             | 3.47         |                  |
| 246             | 0.55         |          | 296             | 23.27        |                  |
| 247             | 2.20         |          | 297             | 8.90         |                  |
| 248             | 3.52         |          | 298             | 6.28         |                  |
| 249             | 22.94        |          | 299             | 19.74        |                  |
| 250             | 14.06        |          | 300             | 15.85        |                  |

TABLE 5-2. TEST 6 EVENT YIELDS (Continued)

| EVENT<br>NUMBER | YIELD<br>(%) | COMMENTS |
|-----------------|--------------|----------|
| 301             | 10.17        |          |
| 302             | 49.78        |          |
| 303             | 38.53        |          |
| 304             | 25.65        |          |
| 305             | 42.25        |          |
| 306             | 15.45        |          |
| 307             | 11.32        |          |
| 308             | 7.03         |          |
| 309             | 20.81        |          |
| 310             | 6.86         |          |
| 311             | 18.46        |          |
| 312             | 30.71        |          |
| 313             | 49.18        |          |
| 314             | 7.36         |          |
| 315             | 19.01        |          |
| 316             | 10.77        |          |
| 317             | 14.16        |          |
| 318             | 35.76        |          |
| 319             | 57.81        |          |
| 320             | 31.64        |          |
| 321             | 19.77        |          |
| 322             | 31.93        |          |
| 323             | 24.26        |          |
| 324             | 49.78        |          |

## REFERENCES

1. Henderson, J., "Joint Australian/UK Stack Fragmentation Trials Phase 4 Preliminary Report," *Minutes of the 24th DoD Explosives Safety Seminar*, Aug 1990.
2. Henderson, J., Rees, N. M. J. "Joint Australian/UK Stack Fragmentation Trials Preliminary Phase 3 Report," *Minutes of the 23rd DoD Explosives Safety Seminar*, Aug 1988.
3. Henderson, J., et al., "Joint Australian/UK Stack Fragmentation Trials Phase 2 Report," *Minutes of the 22nd DoD Explosives Safety Seminar*, Aug 1986.
4. Bowman, F., et al., "Joint Australian/UK Stack Fragmentation Trials Phase 1 Report," *Minutes of the 21st DoD Explosives Safety Seminar*, Aug 1984.
5. Roger, M., "Assessment of Hazardous Areas When Storing HD 1.1 Ammunition in French "IGLOO TYPE" Magazines," *Minutes of the 25th DoD Explosives Safety Seminar*, Aug 1992.
6. Swisdak, M. M., "Hazards Produced By Explosions Inside Earth-Covered Igloos," *Minutes of the 25th DoD Explosives Safety Seminar*, Aug 1992.
7. Joachim, C., "Shallow Underground Tunnel/Chamber Explosion Test," *Minutes of the 24th DoD Explosives Safety Seminar*, Aug 1990.
8. Joachim, C., "Accidental Detonations In Underground Munitions Storage Magazines: Predictions of Cover Rupture Pressure," *Minutes of the 24th DoD Explosives Safety Seminar*, Aug 1990.
9. Joachim, C., "Ejecta Hazard Ranges From Underground Munitions Storage Magazines," *Minutes of the 24th DoD Explosives Safety Seminar*, Aug 1990.
10. *United Nations Recommendations on the Transport of Dangerous Goods, Tests and Criteria*, Second Edition, ST/SG/AC.10/11/Rev 1.
11. Porzel, F. B., "Technology Base of the Navy Explosives Safety Improvement Program," *Minutes of the 19th DoD Explosives Safety Seminar*, Sep 1980.

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| <b>13. ABSTRACT (Maximum 200 words)</b><br><p>To date, nearly all efforts in the field of accidental explosion consequence determination has been aimed at the quantification of the effects of a Hazard Division (HD) 1.1 event. Little attention has been payed to the consequences of the ignition of stacks of HD 1.2 ammunition. In 1989, NATO AC/258 (Group of Experts on the Safety Aspects of Transportation and Storage of Military Ammunition and Explosives) agreed that a program of trials should be carried out to investigate the consequences of an HD 1.2 event. The goal of these trials would be twofold: to gain basic knowledge about HD 1.2 phenomena and to revise the current NATO quantity-distance relationships for HD 1.2 events.</p> <p>As a result of the NATO interest, a joint United Kingdom/United States (UK/US) experimental program was started in 1990. To date, six tests have been conducted: three single-pallet tests (30 projectiles/test), two 8-pallet tests (240 projectiles/test), one 27-pallet test (864 projectiles). This report describes the test program and the instrumentation used and summarizes the instrumentation results which have been obtained.</p> |                                                                 |                                                                |                                                                     |  |
| <b>14. SUBJECT TERMS</b><br>Explosion<br>HD 1.2<br>Propagation<br>Testing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                 |                                                                | <b>15. NUMBER OF PAGES</b><br>81                                    |  |
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