**HELIUM INJECTION INSPECTION FOR THE EVALUATION OF
SEPTIFOIL SEATING (U)**

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HELIUM INJECTION INSPECTION FOR THE EVALUATION OF
SEPTIFOIL SEATING (U)

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1.0 Summary

This report describes the design development process and proof-of-concept testing for the Septifoil Helium Injection Inspection Technique. This inspection technique may be used to demonstrate that a reactor septifoil is properly installed on its supply pin. The inspection technique has been shown to successfully identify correct and incorrect (mis-seated) installation of a septifoil with little likelihood of a false indication.

2.0 Introduction

The septifoil housing contains the control rods which are used to control the flux profiles in the SRS reactors. These rods require continuous cooling when they are below the top of the housing. The septifoil housing assembly is designed to allow it to be removed from the reactor tank. When it is reinstalled it must mate with the coolant supply pin at the reactor tank bottom. It is possible to install the housing without correctly mating with the supply pin. When this occurs no forced coolant is available to cool the control rods and the assembly is described as mis-seated or unseated.

A new inspection technique to evaluate if the septifoil housing is correctly installed has been successfully demonstrated. This method requires the injection of helium at the septifoil supply pin pressure tap. When a septifoil is correctly seated the helium will enter the housing and can be collected in a sample tube. Correct septifoil installation would be demonstrated by the inflation of a balloon attached to the sample tube. The inflation time would normally be less than 1 minute. If the septifoil is not correctly seated then helium would not enter the housing and the balloon would not inflate.

This report documents the proof-of-concept testing which was completed using air as the injected gas and a concept sample tube. The final sample tube should be constructed and demonstrated before the septifoil helium injection inspection technique can be put into practice.

2.1 Nomenclature

n	Number of samples
$\bar{x}$	Sample average
t	Student-t value two-tailed, 95% coverage
ω	Uncertainty
σ	Sample standard deviation

3.0 Analysis

3.1 System Description - The reactor control rods are located in housings (septifoil assemblies) which are installed through the top of the reactor tank. Within each of 61 housings are seven rods: 2 cadmium rods, 3 full-length control rods and 2 partial-length control rods. The control rods are

constructed of a lithium aluminium alloy core and an aluminum sheath. All of these rods are approximately 14 feet long. The rods are separated by a thin aluminum perforated web. The rods and the web are inserted into the housing. Above this septifoil assembly is the Actuator Long Latch System. This system is used to remotely position the height of the control rods during reactor operations.

The septifoil assembly produces heat (gamma and neutron absorption) during reactor operation. Coolant for the rods is provided from a ring-header which is below the reactor tank. Coolant from the ring header is injected into the septifoil assembly from the bottom. The coolant travels up through the housing and is discharged through 24 holes in the top of the housing. (This is based on the type Q septifoil design.)

- 3.2 Inspection Concept** - When helium or air is injected into the coolant supply branch at the base of the septifoil assembly the gas will travel upward and out through the septifoil supply pin. If the septifoil is correctly seated the gas will enter the septifoil, continue to rise and exit through the discharge holes and the semi-permanent sleeve (See Figure 1). If the septifoil is not correctly seated the gas exiting the supply pin will not enter the septifoil housing.

A sample tube inserted into a correctly seated septifoil housing, as shown in Figure 2, will collect some of this rising gas. The gas entering the tube will displace water as shown in Figure 3. This displacement will create a differential pressure as shown in Figure 4. This pressure can be directly measured or used to inflate a balloon.

When a septifoil is not correctly seated, injected gas is not expected in the septifoil housing. No displacement of liquid should therefore occur and the balloon will not inflate. If the bottom of the sample tube is below the septifoil housing discharge holes, any gas which might enter these holes for an unseated septifoil will not be collected in the sample tube.

- 3.3 Optimization** - The time necessary to inflate the balloon is an important parameter. If this time is too long the inspection method will be very costly in manpower and radiation exposure. In addition, the inflation times must be at least an order of magnitude smaller than the expected inflation times for evolution of gas by dissolution from the coolant combined with hydrogen generation.

To reduce the inflation time the collection opening at the bottom of the sample tube must be as large as possible (while small enough to enter the housing). The volume of the sample tube and the balloon must be kept small to reduce the amount of air which must enter the tube to allow full inflation. The tube must also be large enough that capillary movement of the water column does not occur.

4.0 Experimental Program

4.1 Description of Test Apparatus

4.1.1 General - The septifoil housing is segmented by a perforated aluminum web. This web creates 7 different primary passages where the control and cadmium rods are located. Each passage contains one rod. Figure 5 presents the labeling scheme for these primary passages (i.e. the rod locations). The majority of the data contained in this report was taken with the sample tube installed in the center location, position G.

Several different arrangements of sample systems were constructed. This report will focus on two basic designs which were used to collect the data in this report. Both basic designs used the same collection fitting (Figure 6). This fitting was constructed of a CPVC adaptor and a 3/8" tube x 3/8" MPT adaptor. The CPVC adaptor was machined to produce a 25 mm [0.98"] OD and a 21 mm [0.83"] diameter by 45° countersink at the base. The adaptor inside diameter was increased to 19.8 mm [0.278"].

The sample tube was constructed of 3/8" OD x 0.035" wall stainless steel tubing. The distance from the bottom of the sample tube to the top of the air-water separator (See Figure 7.) was 2.82 m [111.1"]. A shoulder was installed 2.32 m [91.5"] above the base of the sample tube. This shoulder allowed the sample tube to hang from the top spider which is located in the semipermanent sleeve.

The Long Term Flow Facility (LTFF) in the Heat Transfer Laboratory, Building 786-A, was modified as shown in Figure 1. Water was provided from the Building 786-A process water system. The air was supplied from the building plant air system.

4.1.2 Construction 1 - The sample tube designated as Construction 1 is shown in Figure 1. The vent line was 3/8" OD x 0.035" wall tube. The balloon was a Mylar type with an uninflated diameter of 114 mm [4.5"] and an inflated volume of 211±5 milliliters. The balloon was slipped over a 1/4"OD tube and held in place with tape. A reducer was inserted between the vent branch tee and the balloon.

For Block 2 (Test number 26) a short section (~2" long) of 1/2" pipe was installed below the vent line. This pipe was to serve as an air-water separator.

4.1.3 Construction 2 - A second style air-water separator was installed between the sample tube and the balloon. (See Figure 7.) Two different balloons were used. The balloon described in Section 4.1.2 was used for Block 5 data (test runs 45 through 47) while a larger balloon was used for Blocks 6 and 7 (test numbers 48 though 52). This larger balloon was again a Mylar type with an uninflated diameter of 121 mm [4.75"] and an inflated volume of 219±18 milliliters. The balloon was slipped over a 1/4"OD tube and held in place with two O-rings. The O-rings were installed by slipping

them over the balloon stem, sliding the balloon stem onto the tube, then rolling the O-rings down over the tube.

The drain/vent line at the base of the separator was routed into the semipermanent sleeve to allow accumulated water to drain back into the tank.

4.2 Data Collection - The testing of Construction 1 and 2 were completed in conformance with NRTSC Technical Procedure TP-92-019, *Septifoil Helium Inspection Procedure*, Revision 0.

4.3 Instrumentation - The instrumentation for the evaluation of Construction 1 and 2 is listed in Table 1.

Table 1			
Instrumentation used for Construction 1 and 2			
Item	Function	M&TE Number	M&TE Tolerance ¹
Armitron model M146 stopwatch	Time balloon inflation rate.	TR-290G	±1000 msec/sec
Ametec, S&K rotameter	Liquid flow	TR-20276	±4.71 Lpm(1.25 gpm)
Thermometer	Liquid and ambient air temperature	TR-462	±1°C
Omega model FMA-308-V, air mass flow meter	Gas supply rate	TR-21627	± 2 Lpm
Omega model FMA-308-V, air mass flow meter	Gas vent rate	TR-20079	± 2 Lpm
HP 3457A	Voltage output from air mass flow meters	TR-509	± 82 mvolts (0.3 to 3 volts) ± 1400 mvolts (3 to 30 volts)
Sensotec barometer, model EB/1250-01-01	Ambient absolute pressure	TR-710	± 0.072 "Hg

4.4 Measurement Uncertainties

4.4.1 Instrument Uncertainty - The HTL tolerances for the instruments used to produce the data in this task are listed in Table 1. Except as noted below these may be considered the measurement uncertainty.

4.4.2 Time - In addition to the rate of the stopwatch, the trigger error must be estimated. This uncertainty is considered to be 0.2 seconds as recommended by ASME PTC 19.12-1958.

4.4.3 Level - The tank level indication must include both an elevation measurement error and the dynamic effect which is created at the overflow weir. The combined uncertainty is estimated to be ±0.5 inches.

¹ Post-test calibrations were not completed when this report was prepared.

5.0 Results and Discussion

5.1 Test Matrix - The testing was separated into 7 blocks and 4 different constructions. A summary of these blocks is listed in Table 2.

5.1.1 Block 1 - This block covers all of the 3 and 6 rod data and the bulk of the 0 rod data. The results are presented in Figures 8 through 13. For this block the septifoil was correctly seated on the upflow pin. No air-water separator was in use at the balloon² and the sample tube was installed in the center location, position G.

5.1.2 Block 2 - One test was conducted using a short length of 1/2" pipe which was installed to serve as an air-water separator in the sample tube. For this test the septifoil was correctly seated on the upflow pin and the sample tube was installed in the center location, position G.

5.1.3 Block 3 - These tests evaluated the effect of locating the sample tube in a position other than the central location. Three different positions: C, E, and G were tried. The configuration was identical to Block 1 in all other respects.

5.1.4 Block 4 - These tests evaluated the effect of mis-seating the septifoil. The septifoil housing was intentionally lifted off the supply pin then lowered such that it was at the correct elevation but not engaged on the supply pin. The configuration was identical to Block 1 in all other respects.

5.1.5 Block 5 - These tests evaluated the air-water separator shown in Figure 7. The septifoil was correctly installed on the upflow pin, the sample tube was installed in the center location, position G, and the smaller of the two tested balloons was used.

5.1.6 Block 6 - These tests also evaluated the air-water separator shown in Figure 7. With the exception of the larger balloon being used, this configuration was identical to Block 5.

5.1.7 Block 7 - For these tests air was injected through a 1/4" OD x 0.035" wall SST tube into one of the septifoil discharge holes rather than at the septifoil supply pin. (This was to simulate an unseated septifoil where gas travels up the outside of the housing and enters the septifoil at the discharge holes.) The septifoil was correctly seated on the upflow pin. The air-water separator in Figure 7 was installed below the balloon and the sample tube was installed in the center location, position G.

²

For most of the Block 1 testing with 3 and 6 rods, no behavior was observed which indicated the need for a separator.

Table 2				
Test and Construction Matrix				
Block Number	Number of Rods	Construction ³	Septifoil Position	Comments
1	0, 3 & 6	1.0	Seated	
2	0	1.1	Seated	Short pipe style air-water separator.
3	0	1.0	Seated	Different sampling locations.
4	0	1.0	Mis-seated	
5	0	2.0	Seated	Figure 7 air-water separator was used.
6	0	2.1	Seated	Figure 7 air-water separator was used.
7	0	2.1	Seated	Air was injected at the top of the septifoil.

5.2 Test Results

5.2.1 Block 1 - The results from this block of testing is shown in Figures 8 through 13. Figures 8 and 9 are a summary of all of the data. The inflation times for 6 installed rods were significantly greater than the inflation times for the 0 and 3 rod tests. The inflation times for the 6 rod tests were also a strong function of both supply gas and liquid flow rates. For these 6 rod tests it is possible to maximize the time required to inflate the balloon. This maximum would occur for a gas flow rate of about 25 liters/min and a liquid flow rate of 50 liters/min. The inflation time for this condition will be over 40 minutes. This is the opposite of what would be desired (i.e. to minimize the inflation time).

Figures 10 and 11 provide all of the 3 rods inserted tests. The inflation times for this condition varied from 1.4 to 4.1 minutes. The inflation time seems to be a function of both the gas supply and liquid flow rates with an interacting effect.

Figures 12 and 13 present the Block 1 data for all of the rods removed and the sample tube in the center location, position G. The times varied between 0.43 minutes [26 seconds] and 2.18 minutes [130 seconds]. It appears that it will be possible to optimize the gas supply rate to keep the inflation time at a minimum. The inflation times were lowest for no liquid flow.

During many of the best (shorter) inflation time runs, water was observed entering the balloon and the vent gas flow meter. The water entering the vent meter did affect its output. The zero flow output for a dry meter was 0.0055 volts or 0.70 Lpm. The zero flow output for a wet meter was 0.023 volts or 0.86 Lpm. The meter was dried out after each wetting. For zero rods inserted tests, an air-water separator was installed in the vent line to prevent meter wetting.

- 5.2.2 Block 2** - The air-water separator which consisted of a short length of 1/2" schedule 40 pipe did not prevent water from entering the balloon.
- 5.2.3 Block 3** - Figures 14 and 15 display the effect of varying the sample location. The Block 3, position G data point follows the data trend established by the Block 1 data thus demonstrating repeatability of the tests. The inflation times for the positions C and E were much lower than for the center position (0.30, 0.25 and 1.017 minutes respectively). This indicates that the gas flow distribution in the septifoil housing is not uniform, and that the location of the sample tube will affect the inflation times.
- 5.2.4 Block 4** - No inflation of the balloon was observed during the ten minute test period when the septifoil was mis-seated.
- 5.2.5 Blocks 5 & 6** - The inflation times for the sample system with the installed air water separator varied from 0.42 to 0.86 minutes. Figure 16 indicates that the size of the balloon does not have a significant effect on the result. Flow into the separator alternated between liquid and vapor. The water geysered from the tube and struck the top pipe cap. Once the liquid was completely displaced the geyserring effect stopped.
- 5.2.6 Block 7** - When gas was injected into one of the discharge holes at the top of the septifoil housing no inflation of the balloon was observed during the ten minute test period.
- 5.2.7 General Observations** - When the sample tube was lowered into the septifoil the collector would catch on each of the spider positions in the muff section. A guide system could be constructed at the end of the collector to assist the operator in inserting the sample tube.
- 6.0 Conclusions**
- 6.1** The proposed helium injection inspection test should successfully detect an unseated septifoil and should be fully demonstrated.
- 6.2** A guide assembly should be installed at the base of the collector to assist the operator in installing the sample tube.
- 6.3** The final sample tube design should be qualified over the entire expected range of use since the inflation times are strongly influenced by both the gas supply and liquid flow rates.
- 6.4** The final sample tube design should be qualified in the LTFF which is equipped with a prototypic coolant supply branch since the gas flow has been demonstrated to be non-uniform.
- 6.5** A cost benefit analysis should be completed to judge whether improvements to the septifoil pin measurement system (See WSRC-TR-92-130), the proposed high ring seat, or the helium injection technique should be used

to put the mis-seated septifoil accident below the design basis probability threshold. This evaluation should include the personnel radiation exposure for each method.

7.0 References

1. Coutts, D. A., *Instrument Uncertainty Predictions*, WSRC-TR-91-435, July 1991.
2. Coutts, D. A., *Uncertainty Analysis of the Unseated Septifoil Evaluation Methods (U)*, WSRC-TR-92-130, March 1992.
3. *Measurement of Time*, ASME PTC 19.12, American Society of Mechanical Engineers, 1958.

Figure 3, Gas Movement

Figure 4, Displacement Detail

Figure 5, Rod Location Nomenclature (Plan View)

Figure 6, Collection Fitting (Photograph 92-1484-3)

Figure 7, Air Water Separator (Photograph 92-1484-2)

Figure 8, Gas flow rate effect

Figure 9, Liquid flow rate effect

Figure 10, Gas flow rate effect with 3 rods

Figure 11, Liquid flow rate effect with 3 rods

Figure 12, Gas flow rate effect with all rods removed

Figure 13, Liquid flow rate effect with all rods removed

Figure 14, Sample location and gas flow rate effect

Figure 15, Sample location and liquid flow rate effect

Figure 16, Construction 2 results with no liquid flow

Appendix A
Data Reduction

General - The pretest calibration curves for the water rotameter and the air mass flow meters were used for data reduction. The measurement uncertainty was estimated as the pretest M&TE tolerance as suggested in Reference 1 when the pretest calibration curve is used for data reduction. The measurement uncertainty for all other instruments was also estimated based on the theoretical tolerance and the fixed operating curve.

Liquid Flow (TR-20276) - The liquid flow rate recorded on the data sheets was converted from mm to gpm in the field using the equation:

$$Q = 0.116 Y - 1.151$$

where

Q is the flow rate [gpm]
Y is rotameter indication [mm]

This equation is a least-mean-square fit of the pretest calibration data. The reduced data was obtained using the conversion:

$$1 \text{ liter} = 0.2642 \text{ gallons}$$

Gas Injection Flow (TR-21672) - The gas injection flow rate was recorded on the data sheets as an indicated voltage. The voltage was recorded using an HP 3457A programmable meter (TR-509). Data was converted from engineering units using the equation:

$$Q = 9.5749 V - 0.011584$$

where

Q is the flow rate [sLpm]
V is output voltage [volts]

Gas Vent Flow (TR-20079) - The gas vent flow rate was recorded on the data sheets as an indicated voltage. The voltage was recorded using an HP 3457A programmable meter (TR-509). Data was converted from engineering units using the equation:

$$Q = 9.4213 V + 0.64369$$

where

Q is the flow rate [Lpm]
V is output voltage [volts]

Tank Level - The tank level was measured using a sight tube which was connected to the bottom of the tank. The reduced data was obtained using the conversion:

$$1 \text{ m} = 39.37 \text{ inches}$$

Barometric Pressure (TR-710) - The barometric pressure was reduced using the conversion:

$$1'' \text{ Hg} = 3376.8 \text{ Pa}$$

Appendix B
Field Data Sheet Formats

Date:		Procedure Number:		Procedure Revision:			
		Printed		Signature			
Test Engineer							
Technician							
M&TE Data							
Item	M&TE Number	Calibration Due Date	Item	M&TE Number	Calibration Due Date		
Stopwatch			Gas Supply Flow				
Liquid Flow			HP 3457A				
Liquid Thermometer			Gas Vent Flow				
Ambient Thermometer			Barometer				
Daily Check at Start of Testing		Liquid Flow gpm	Gas Supply Flow		Gas Exhaust Flow		Inflation Time seconds
			X volts	σ volts	X volts	σ volts	
Time Started							NA
Number of Rods							NA
Air Temperature, °C							NA
Liquid Temperature, °C		Comments:					
Tank Level, inches							
Barometric Pressure, "Hg							
Time Completed							
Daily Check at End of Testing		Liquid Flow gpm	Gas Supply Flow		Gas Exhaust Flow		Inflation Time seconds
			X volts	σ volts	X volts	σ volts	
Time Started							NA
Number of Rods							NA
Air Temperature, °C							NA
Liquid Temperature, °C		Comments:					
Tank Level, inches							
Barometric Pressure, "Hg							
Time Completed							

		Liquid	Gas Supply Flow		Gas Exhaust Flow		Inflation
Test Number		Flow gpm	X volts	σ volts	X volts	σ volts	Time seconds
Time Started							
Number of Rods							
Air Temperature, °C							
Liquid Temperature, °C		Comments:					
Tank Level, inches							
Barometric Pressure, "Hg							
Time Completed							

		Liquid	Gas Supply Flow		Gas Exhaust Flow		Inflation
Test Number		Flow gpm	X volts	σ volts	X volts	σ volts	Time seconds
Time Started							
Number of Rods							
Air Temperature, °C							
Liquid Temperature, °C		Comments:					
Tank Level, inches							
Barometric Pressure, "Hg							
Time Completed							

		Liquid	Gas Supply Flow		Gas Exhaust Flow		Inflation
Test Number		Flow gpm	X volts	σ volts	X volts	σ volts	Time seconds
Time Started							
Number of Rods							
Air Temperature, °C							
Liquid Temperature, °C		Comments:					
Tank Level, inches							
Barometric Pressure, "Hg							
Time Completed							

Appendix C
Field and Reduced Data

Notes:

1. The average for the liquid flow, gas supply flow and vent flow was the arithmetic average of the available data. The term "na" indicates that no data was available.
2. The value σ_1 was calculated from the arithmetic average of the available readings for the engineering units of the gas supply sigma and vent flow sigma. The term "na" indicates that less than 2 samples were available, so no value was computed.
3. The value σ_2 was the standard deviation of the liquid flow, gas supply flow and vent flow of the available data. The term "na" indicates that less than 2 samples were available, so no value was computed.
4. The uncertainty is calculated from:

$$\omega = [(2.0 \sigma_1)^2 + (t_{n-1} \sigma_2)^2 + \omega_{M\&TE}^2]^{1/2}$$

If either σ_1 or σ_2 were listed as "na" then no value was computed.

5. Where a value of -1 appears in the raw field data no value was recorded. Where a value of -10 appears in the raw field data the balloon did not inflate over a period of greater than 10 minutes.
6. The value for the date under the Raw Field Data is the serial date. This value has been truncated.

Test Number	Date	Block Number	Number of Rods	Design Number	Liquid Flow liters/min	Gas Supply liters/min	Gas Vent Flow liters/min	Inflation Time minutes
1	4/14/92	1	6	1.0	37.951	9.691	0.799	13.233
2	4/14/92	1	6	1.0	56.662	39.222	0.927	30.033
3	4/14/92	1	6	1.0	38.090	9.841	0.837	13.250
4	4/14/92	1	6	1.0	56.813	38.601	0.949	28.067
5	4/14/92	1	6	1.0	57.116	10.138	0.808	9.667
6	4/14/92	1	6	1.0	47.464	24.988	0.941	43.350
7	4/15/92	1	6	1.0	37.812	38.795	1.156	22.532
8	4/15/92	1	6	1.0	37.812	38.728	1.172	21.783
9	4/15/92	1	6	1.0	47.464	25.167	0.954	41.167
10	4/15/92	1	6	1.0	56.662	10.096	0.786	8.750
11	4/16/92	1	3	1.0	38.090	38.122	1.203	1.867
12	4/16/92	1	3	1.0	47.464	25.257	0.988	2.350
13	4/16/92	1	3	1.0	56.662	10.182	0.995	1.439
15	4/20/92	1	3	1.0	56.523	38.566	0.908	4.122
16	4/20/92	1	3	1.0	37.812	9.675	0.954	1.511
19	4/20/92	1	3	1.0	47.464	25.237	0.918	2.739
21	4/21/92	1	0	1.0	56.662	38.952	0.981	1.744
22	4/21/92	1	0	1.0	37.812	38.853	1.175	1.194
25	4/21/92	1	0	1.0	37.812	10.224	1.186	0.783
26	4/21/92	2	0	1.1	37.812	10.128	0.906	2.133
27	4/21/92	1	0	1.0	56.662	10.186	0.689	2.183
31	4/14/92	1	6	1.0	57.267	4.896	0.779	9.083
32	4/21/92	1	0	1.0	0.000	10.291	-1	0.733
33	4/21/92	1	0	1.0	0.000	24.864	1.261	0.433
34	4/21/92	1	0	1.0	0.000	38.256	1.314	0.628
35	4/22/92	3	0	1.0	37.812	38.575	-1	0.300
36	4/22/92	3	0	1.0	37.812	38.719	-1	0.250
37	4/22/92	3	0	1.0	37.951	38.751	1.189	1.017
38	4/23/92	4	0	1.0	56.662	39.044	0.863	-10
39	4/23/92	4	0	1.0	37.812	39.073	0.863	-10
40	4/23/92	4	0	1.0	37.509	10.036	0.863	-10
41	4/23/92	4	0	1.0	56.649	10.036	0.863	-10
42	4/24/92	4	0	1.0	0.000	10.269	0.863	-10
43	4/24/92	4	0	1.0	0.000	25.630	0.863	-10
44	4/24/92	4	0	1.0	0.000	39.044	0.863	-10
45	4/24/92	5	0	2.0	0.000	10.052	0.915	0.467
46	4/24/92	5	0	2.0	0.000	24.925	1.280	0.639
47	4/24/92	5	0	2.0	0.000	39.163	1.214	0.728
48	4/27/92	6	0	2.1	0.000	10.109	-1	0.417
49	4/27/92	6	0	2.1	0.000	24.669	-1	0.733
50	4/27/92	6	0	2.1	0.000	39.839	-1	0.861
51	4/27/92	7	0	2.1	0.000	9.844	0.695	-10
52	4/28/92	7	0	2.1	0.000	39.501	0.695	-10

Septifoil Helium Testing, Reduced_Data_2, Wednesday, May 6, 1992, Page 1

REDUCED DATA

Test Number	1				
Date	4/14/92				
Time Started	10:05				
Number of Rods	6.00				
Air Temperature, C	20.50				
Liquid Temperature, C	20.10				
Tank Level, meters	4.88				
Barometric Pressure, Pa	101034				
Time Completed	11:00				
Number of Rods	6				
Block Number	1				
	Average	Sigma 1	Sigma 2	Uncertainty	
Liquid Flow, liters/min	37.951	na	0.2404	1.0676	
Gas Supply Flow, l/min	9.691	0.0774	0.0527	2.0188	
Vent Flow, liters/min	0.799	0.0787	0.0068	2.0064	
Inflation Time, minutes	13.233	na	0.2963	1.2750	

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	1	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27860544...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	36300		volts	volts	volts	volts	seconds
Air Temperature, C	20.5	9.99	1.008	0.009688	0.016767	0.007376	808
Liquid Temperature, C	20.1	10.1	1.013	0.007374	0.015723	0.008517	800
Tank Level, inches	192	9.99	1.019	0.007204	0.017103	0.009163	774
Barometric Press., "Hg	29.92						
Time Completed	39600						
Number of Rods	6						
Block Number	1						

REDUCED DATA

Test Number	2
Date	4/14/92
Time Started	12:35
Number of Rods	6.00
Air Temperature, C	22.10
Liquid Temperature, C	20.20
Tank Level, meters	4.88
Barometric Pressure, Pa	100966
Time Completed	13:50
Number of Rods	6
Block Number	0

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	56.662	na	0.0000	0.2642
Gas Supply Flow, l/min	39.222	0.1292	0.1828	3.0760
Vent Flow, liters/min	0.927	0.0878	0.0032	2.0081
Inflation Time, minutes	30.033	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	2	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27860544...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	45300		volts	volts	volts	volts	seconds
Air Temperature, C	22.1	14.97	4.111	0.010899	0.029875	0.008798	1802
Liquid Temperature, C	20.2	14.97	4.084	0.016088	0.030348	0.009849	-1
Tank Level, inches	192	-1	-1	-1	-1	-1	-1
Barometric Press., "Hg	29.9						
Time Completed	49800						
Number of Rods	6						
Block Number	0						

Septifoll Hellum Testing, Reduced_Data_2, Wednesday, May 6, 1992, Page 1

REDUCED DATA

Test Number	3
Date	4/14/92
Time Started	16:05
Number of Rods	6.00
Air Temperature, C	22.00
Liquid Temperature, C	20.00
Tank Level, meters	4.88
Barometric Pressure, Pa	100629
Time Completed	16:35
Number of Rods	6
Block Number	1

Block Number	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	38.090	na	0.2404	1.0676
Gas Supply Flow, l/min	9.841	0.0881	0.0663	2.0279
Vent Flow, liters/min	0.837	0.0645	0.0038	2.0042
Inflation Time, minutes	13.250	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	3	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27860544...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	57900		volts	volts	volts	volts	seconds
Air Temperature, C	22	9.99	1.037	0.012766	0.020905	0.006071	795
Liquid Temperature, C	20	10.1	1.025	0.006153	0.020681	0.007339	-1
Tank Level, inches	192	10.1	1.025	0.008679	0.020128	0.007136	-1
Barometric Press., "Hg	29.8						
Time Completed	59700						
Number of Rods	6						
Block Number	1						

REDUCED DATA

REDUCED DATA

Test Number	4			
Date	4/14/92			
Time Started	16:35			
Number of Rods	6.00			
Air Temperature, C	23.60			
Liquid Temperature, C	20.50			
Tank Level, meters	4.88			
Barometric Pressure, Pa	100561			
Time Completed	17:45			
Number of Rods	6			
Block Number	1			
	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	56.813	na	0.2622	1.1588
Gas Supply Flow, l/min	38.601	0.1350	0.0774	2.0454
Vent Flow, liters/min	0.949	0.0959	0.0119	2.0098
Inflation Time, minutes	28.067	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	4	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27860544...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	59700		volts	volts	volts	volts	seconds
Air Temperature, C	23.6	14.97	4.028	0.013714	0.033642	0.011508	1684
Liquid Temperature, C	20.5	14.97	4.042	0.011911	0.031128	0.009414	-1
Tank Level, inches	192	15.09	4.028	0.016686	0.032297	0.009617	-1
Barometric Press., "Hg	29.78						
Time Completed	63900						
Number of Rods	6						
Block Number	1						

Septifoll Helium Testing, Reduced_Data_2, Wednesday, May 6, 1992, Page 1

REDUCED DATA

Test Number	5			
Date	4/14/92			
Time Started	17:45			
Number of Rods	6.00			
Air Temperature, C	22.80			
Liquid Temperature, C	20.40			
Tank Level, meters	4.88			
Barometric Pressure, Pa	100494			
Time Completed	18:20			
Number of Rods	6			
Block Number	1			
	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	57.116	na	0.0000	0.2642
Gas Supply Flow, l/min	10.138	0.0865	0.0479	2.0180
Vent Flow, liters/min	0.808	0.0691	0.0186	2.0064
Inflation Time, minutes	9.667	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	5	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27860544...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	63900		volts	volts	volts	volts	seconds
Air Temperature, C	22.8	15.09	1.055	0.009499	0.016096	0.007425	580
Liquid Temperature, C	20.4	15.09	1.065	0.009247	0.019712	0.007257	-1
Tank Level, inches	192	15.09	1.06	0.00837	0.016517	0.007332	-1
Barometric Press., "Hg	29.76						
Time Completed	66000						
Number of Rods	6						
Block Number	1						

Septifoll Hellum Testing, Reduced_Data_2, Wednesday, May 6, 1992, Page 1

REDUCED DATA

Test Number	6
Date	4/14/92
Time Started	18:20
Number of Rods	6.00
Air Temperature, C	22.60
Liquid Temperature, C	20.50
Tank Level, meters	4.88
Barometric Pressure, Pa	100494
Time Completed	19:50
Number of Rods	6
Block Number	1

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	47.464	na	0.0000	0.2642
Gas Supply Flow, l/min	24.988	0.1306	0.0507	2.0287
Vent Flow, liters/min	0.941	0.0906	0.0143	2.0091
Inflation Time, minutes	43.350	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	6	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27860544...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	66000		volts	volts	volts	volts	seconds
Air Temperature, C	22.6	12.54	2.607	0.016597	0.030568	0.009871	2601
Liquid Temperature, C	20.5	12.54	2.617	0.009449	0.0309	0.00826	-1
Tank Level, inches	192	12.54	2.609	0.014868	0.033339	0.010724	-1
Barometric Press., "Hg	29.76						
Time Completed	71400						
Number of Rods	6						
Block Number	1						

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REDUCED DATA

Test Number	7				
Date	4/15/92				
Time Started	08:55				
Number of Rods	6.00				
Air Temperature, C	20.80				
Liquid Temperature, C	20.30				
Tank Level, meters	4.88				
Barometric Pressure, Pa	100696				
Time Completed	09:45				
Number of Rods	6				
Block Number	1				
	Average	Sigma 1	Sigma 2	Uncertainty	
Liquid Flow, liters/min	37.812	na	0.0000	0.2642	0.000000
Gas Supply Flow, l/min	38.795	0.1611	0.0818	2.0561	-0.011584
Vent Flow, liters/min	1.156	0.1368	0.0440	2.0275	0.643690
Inflation Time, minutes	22.533	na	na	na	na
					b
					m
					u
					0.000000
					3.7850
					0.26420
					2.00000
					2.00000
					0.00333

RAW FIELD DATA

Test Number	7	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27861408...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	32100		volts	volts	volts	volts	seconds
Air Temperature, C	20.8	9.99	4.052	0.018648	0.059022	0.014051	1352
Liquid Temperature, C	20.3	9.99	4.045	0.014437	0.049672	0.013567	-1
Tank Level, inches	192	9.99	4.062	0.017383	0.054397	0.015949	-1
Barometric Press., "Hg	29.82						
Time Completed	35100						
Number of Rods	6						
Block Number	1						

Septifoll Helium Testing, Reduced_Data_2, Wednesday, May 6, 1992, Page 1

REDUCED DATA

Test Number	8
Date	4/15/92
Time Started	09:45
Number of Rods	6.00
Air Temperature, C	21.20
Liquid Temperature, C	20.50
Tank Level, meters	4.88
Barometric Pressure, Pa	100696
Time Completed	10:30
Number of Rods	6
Block Number	1

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	37.812	na	0.0000	0.2642
Gas Supply Flow, l/min	38.728	0.1588	0.0760	2.0513
Vent Flow, liters/min	1.172	0.1485	0.0060	2.0221
Inflation Time, minutes	21.783	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	8	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27861408...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	35100		volts	volts	volts	volts	seconds
Air Temperature, C	21.2	9.99	4.055	0.014946	0.055317	0.014424	1307
Liquid Temperature, C	20.5	9.99	4.043	0.021782	0.056446	0.016939	-1
Tank Level, inches	192	9.99	4.04	0.013042	0.056384	0.015931	-1
Barometric Press., "Hg	29.82						
Time Completed	37800						
Number of Rods	6						
Block Number	1						

Septifoll Hellum Testing, Reduced_Data_2, Wednesday, May 6, 1992, Page 1

REDUCED DATA

Test Number	9
Date	4/15/92
Time Started	10:30
Number of Rods	6.00
Air Temperature, C	21.70
Liquid Temperature, C	20.30
Tank Level, meters	4.88
Barometric Pressure, Pa	100696
Time Completed	11:30
Number of Rods	6
Block Number	1

Block Number	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	47.464	na	0.0000	0.2642
Gas Supply Flow, l/min	25.167	0.0840	0.0814	2.0374
Vent Flow, liters/min	0.954	0.0985	0.0045	2.0098
Inflation Time, minutes	41.167	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	9	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27861408...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	37800		volts	volts	volts	volts	seconds
Air Temperature, C	21.7	12.54	2.636	0.009616	0.033222	0.010774	2470
Liquid Temperature, C	20.3	12.54	2.633	0.008076	0.033167	0.009666	-1
Tank Level, inches	192	12.54	2.62	0.008633	0.032366	0.010935	-1
Barometric Press., "Hg	29.82						
Time Completed	41400						
Number of Rods	6						
Block Number	1						

REDUCED DATA

REDUCED DATA

Test Number	10			
Date	5/15/92			
Time Started	12:05			
Number of Rods	6.00			
Air Temperature, C	22.80			
Liquid Temperature, C	20.30			
Tank Level, meters	4.88			
Barometric Pressure, Pa	100662			
Time Completed	13:30			
Number of Rods	6			
Block Number	1			
	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	56.662	na	0.0000	0.2642
Gas Supply Flow, l/min	10.096	0.4160	0.0336	2.1710
Vent Flow, liters/min	0.786	0.0737	0.0083	2.0057
Inflation Time, minutes	8.750	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	10	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27887328...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	43500		volts	volts	volts	volts	seconds
Air Temperature, C	22.8	14.97	1.059	0.11661	0.014661	0.007566	525
Liquid Temperature, C	20.3	14.97	1.052	0.006594	0.014493	0.007843	-1
Tank Level, inches	192	14.97	1.056	0.007129	0.016093	0.008071	-1
Barometric Press., "Hg	29.81						
Time Completed	48600						
Number of Rods	6						
Block Number	1						

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REDUCED DATA

Test Number	11			
Date	4/16/92			
Time Started	13:35			
Number of Rods	3.00			
Air Temperature, C	23.50			
Liquid Temperature, C	20.60			
Tank Level, meters	4.88			
Barometric Pressure, Pa	100595			
Time Completed	14:15			
Number of Rods	3			
Block Number	1			
	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	38.090	na	0.2404	1.0676
Gas Supply Flow, l/min	38.122	0.1413	0.6275	3.3720
Vent Flow, liters/min	1.203	0.1367	0.0189	2.0202
Inflation Time, minutes	1.867	na	0.0441	0.1898

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	11	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27862272...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	48900		volts	volts	volts	volts	seconds
Air Temperature, C	23.5	9.99	4.02	0.010155	0.06011	0.014903	114
Liquid Temperature, C	20.6	10.1	3.907	0.024399	0.057122	0.014069	113
Tank Level, inches	192	10.1	4.021	0.009713	0.060934	0.014542	109
Barometric Press., "Hg	29.79						
Time Completed	51300						
Number of Rods	3						
Block Number	1						

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REDUCED DATA

REDUCED DATA

Test Number	12			
Date	4/16/92			
Time Started	14:15			
Number of Rods	3.00			
Air Temperature, C	23.00			
Liquid Temperature, C	20.60			
Tank Level, meters	4.88			
Barometric Pressure, Pa	100561			
Time Completed	14:50			
Number of Rods	3			
Block Number	1			
	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	47.464	na	0.0000	0.2642
Gas Supply Flow, l/min	25.257	0.0983	0.0913	2.0477
Vent Flow, liters/min	0.981	0.0950	0.0206	2.0110
Inflation Time, minutes	2.350	na	0.1167	0.5022

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	12	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27862272...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	51300		volts	volts	volts	volts	seconds
Air Temperature, C	23	12.54	2.628	0.009995	0.033729	0.011464	141
Liquid Temperature, C	20.6	12.54	2.644	0.008649	0.038086	0.008628	134
Tank Level, inches	192	12.54	2.645	0.012145	0.035532	0.010172	148
Barometric Press., "Hg	29.78						
Time Completed	53400						
Number of Rods	3						
Block Number	1						

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REDUCED DATA

Test Number	13				
Date	4/16/92				
Time Started	14:50				
Number of Rods	3.00				
Air Temperature, C	22.90				
Liquid Temperature, C	20.70				
Tank Level, meters	4.88				
Barometric Pressure, Pa	100527				
Time Completed	15:45				
Number of Rods	3				
Block Number	1				
	Average	Sigma 1	Sigma 2	Uncertainty	
Liquid Flow, liters/min	56.662	na	0.0000	0.2642	
Gas Supply Flow, l/min	10.182	0.0696	0.0199	2.0067	
Vent Flow, liters/min	0.995	0.1008	0.0498	2.0215	
Inflation Time, minutes	1.439	na	0.0385	0.1657	

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	13	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27862272...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	53400		volts	volts	volts	volts	seconds
Air Temperature, C	22.9	14.97	1.063	0.007018	0.033375	0.010588	85
Liquid Temperature, C	20.7	14.97	1.064	0.007213	0.035129	0.011984	89
Tank Level, inches	192	14.97	1.067	0.00759	0.043285	0.00952	85
Barometric Press., "Hg	29.77						
Time Completed	56700						
Number of Rods	3						
Block Number	1						

REDUCED DATA

REDUCED DATA

Test Number	15			
Date	4/20/92			
Time Started	09:25			
Number of Rods	3.00			
Air Temperature, C	22.70			
Liquid Temperature, C	21.50			
Tank Level, meters	4.86			
Barometric Pressure, Pa	99920			
Time Completed	10:15			
Number of Rods	3			
Block Number	1			
	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	56.523	na	0.2404	1.0676
Gas Supply Flow, l/min	38.566	0.0983	0.1295	2.0855
Vent Flow, liters/min	0.908	0.1128	0.0112	2.0133
Inflation Time, minutes	4.122	na	0.0918	0.3950

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	15	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27865728...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	33900		volts	volts	volts	volts	seconds
Air Temperature, C	22.7	14.97	4.028	0.01072	0.029242	0.010815	247
Liquid Temperature, C	21.5	14.97	4.043	0.007476	0.028049	0.012382	253
Tank Level, inches	191.5	14.86	4.016	0.012615	0.026861	0.012722	242
Barometric Press., "Hg	29.59						
Time Completed	36900						
Number of Rods	3						
Block Number	1						

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REDUCED DATA

Test Number	16
Date	4/20/92
Time Started	10:30
Number of Rods	3.00
Air Temperature, C	22.20
Liquid Temperature, C	21.20
Tank Level, meters	4.86
Barometric Pressure, Pa	99886
Time Completed	11:00
Number of Rods	3
Block Number	1

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	37.812	na	0.0000	0.2642
Gas Supply Flow, l/min	9.675	0.0718	0.0276	2.0087
Vent Flow, liters/min	0.954	0.1771	0.0271	2.0345
Inflation Time, minutes	1.511	na	0.0674	0.2900

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	16	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27865728...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	37800		volts	volts	volts	volts	seconds
Air Temperature, C	22.2	9.99	1.015	0.006912	0.032663	0.021661	95
Liquid Temperature, C	21.2	9.99	1.01	0.008251	0.030173	0.020546	90
Tank Level, inches	191.5	9.99	1.01	0.007323	0.035912	0.014185	87
Barometric Press., "Hg	29.58						
Time Completed	39600						
Number of Rods	3						
Block Number	1						

REDUCED DATA

REDUCED DATA

Test Number	19			
Date	4/20/92			
Time Started	11:00			
Number of Rods	3.00			
Air Temperature, C	22.40			
Liquid Temperature, C	21.30			
Tank Level, meters	4.86			
Barometric Pressure, Pa	99886			
Time Completed	11:35			
Number of Rods	3			
Block Number	1			
	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	47.464	na	0.0000	0.2642
Gas Supply Flow, l/min	25.237	0.1331	0.0439	2.0265
Vent Flow, liters/min	0.918	0.1178	0.0132	2.0146
Inflation Time, minutes	2.739	na	0.1575	0.6777

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	19	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27865728...	gpm.	Flow	Sigma	Flow	Sigma	Time
Time Started	39600		volts	volts	volts	volts	seconds
Air Temperature, C	22.4	12.54	2.636	0.013992	0.029515	0.01107	161
Liquid Temperature, C	21.3	12.54	2.633	0.015396	0.027565	0.015053	175
Tank Level, inches	191.5	12.54	2.642	0.012306	0.030276	0.01138	157
Barometric Press., "Hg	29.58						
Time Completed	41700						
Number of Rods	3						
Block Number	1						

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REDUCED DATA

Test Number	21
Date	2/21/92
Time Started	09:10
Number of Rods	0.00
Air Temperature, C	22.00
Liquid Temperature, C	21.60
Tank Level, meters	4.86
Barometric Pressure, Pa	99649
Time Completed	10:20
Number of Rods	0
Block Number	1

Block Number	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	56.662	na	0.0000	0.2642
Gas Supply Flow, l/min	38.952	0.1526	0.1472	2.1200
Vent Flow, liters/min	0.981	0.1374	0.0809	2.0486
Inflation Time, minutes	1.744	na	0.1798	0.7737

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	21	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27814752...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	33000		volts	volts	volts	volts	seconds
Air Temperature, C	22	14.97	4.062	0.010907	0.030029	0.018626	100
Liquid Temperature, C	21.6	14.97	4.059	0.022878	0.03166	0.016457	117
Tank Level, inches	191.5	14.97	4.087	0.014022	0.045648	0.008659	97
Barometric Press., "Hg	29.51						
Time Completed	37200						
Number of Rods	0						
Block Number	1						

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REDUCED DATA

REDUCED DATA

Test Number	22			
Date	2/21/92			
Time Started	10:20			
Number of Rods	0.00			
Air Temperature, C	22.50			
Liquid Temperature, C	21.50			
Tank Level, meters	4.86			
Barometric Pressure, Pa	99649			
Time Completed	#ERR			
Number of Rods	0			
Block Number	1			
	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	37.812	na	0.0000	0.2642
Gas Supply Flow, l/min	38.853	0.1806	0.0582	2.0477
Vent Flow, liters/min	1.175	0.1444	0.0370	2.0270
Inflation Time, minutes	1.194	na	0.1686	0.7255

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	22	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27814752...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	37200		volts	volts	volts	volts	seconds
Air Temperature, C	22.5	9.99	4.063	0.017421	0.052195	0.011671	78
Liquid Temperature, C	21.5	9.99	4.052	0.013674	0.059997	0.017607	77
Tank Level, inches	191.5	9.99	4.062	0.0255	0.056882	0.016705	60
Barometric Press., "Hg	29.51						
Time Completed	-1						
Number of Rods	0						
Block Number	1						

Septifoll Helium Testing, Reduced_Data_2, Wednesday, May 6, 1992, Page 1

REDUCED DATA

Test Number	25
Date	4/21/92
Time Started	11:15
Number of Rods	0.00
Air Temperature, C	22.30
Liquid Temperature, C	21.20
Tank Level, meters	4.86
Barometric Pressure, Pa	99616
Time Completed	12:00
Number of Rods	0
Block Number	1

Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	37.812	na	na
Gas Supply Flow, l/min	10.224	na	na
Vent Flow, liters/min	1.186	na	na
Inflation Time, minutes	0.783	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	25	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27866592...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	40500		volts	volts	volts	volts	seconds
Air Temperature, C	22.3	9.99	1.069	0.006867	0.057593	0.01584	47
Liquid Temperature, C	21.2	-1	-1	-1	-1	-1	-1
Tank Level, inches	191.5	-1	-1	-1	-1	-1	-1
Barometric Press., "Hg	29.5						
Time Completed	43200						
Number of Rods	0						
Block Number	1						

Septifoll Helium Testing, Reduced_Data_2, Thursday, May 7, 1992, Page 1

REDUCED DATA

Test Number	26
Date	4/20/92
Time Started	14:35
Air Temperature, C	22.40
Liquid Temperature, C	20.50
Tank Level, meters	4.86
Barometric Pressure, Pa	99616
Time Completed	14:15
Number of Rods	0
Block Number	2

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	37.812	na	na	na
Gas Supply Flow, l/min	10.128	na	na	na
Vent Flow, liters/min	na	na	na	na
Inflation Time, minutes	2.133	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	26	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27865728...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	52500		volts	volts	volts	volts	seconds
Air Temperature, C	22.4	9.99	1.059	0.006776	0.027822	0.028487	128
Liquid Temperature, C	20.5	-1	-1	-1	-1	-1	-1
Tank Level, inches	191.5	-1	-1	-1	-1	-1	-1
Barometric Press., "Hg	29.5						
Time Completed	51300						
Number of Rods	0						
Block Number	2						

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REDUCED DATA

Test Number	27
Date	4/21/92
Time Started	14:30
Number of Rods	0.00
Air Temperature, C	22.80
Liquid Temperature, C	21.00
Tank Level, meters	4.86
Barometric Pressure, Pa	65713
Time Completed	14:45
Number of Rods	0
Block Number	1

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	56.662	na	na	na
Gas Supply Flow, l/min	10.186	na	na	na
Vent Flow, liters/min	0.689	na	na	na
Inflation Time, minutes	2.183	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	27	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27866592...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	52200		volts	volts	volts	volts	seconds
Air Temperature, C	22.8	14.97	1.065	0.006574	0.0048566	0.018659	131
Liquid Temperature, C	21	-1	-1	-1	-1	-1	-1
Tank Level, inches	191.5	-1	-1	-1	-1	-1	-1
Barometric Press., "Hg	19.46						
Time Completed	53100						
Number of Rods	0						
Block Number	1						

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REDUCED DATA

Test Number	31
Date	4/15/92
Time Started	15:00
Number of Rods	6.00
Air Temperature, C	23.40
Liquid Temperature, C	20.50
Tank Level, meters	4.88
Barometric Pressure, Pa	100426
Time Completed	15:15
Number of Rods	6
Block Number	1

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	57.267	na	0.5245	2.2723
Gas Supply Flow, l/min	4.896	0.0410	0.0108	2.0022
Vent Flow, liters/min	0.779	0.0690	0.0053	2.0049
Inflation Time, minutes	9.083	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	31	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27861408...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	54000		volts	volts	volts	volts	seconds
Air Temperature, C	23.4	14.97	0.5119	0.004726	0.014524	0.007637	545
Liquid Temperature, C	20.5	15.21	0.5118	0.004577	0.013782	0.007275	-1
Tank Level, inches	192	15.21	0.5138	0.003531	0.014889	0.007065	-1
Barometric Press., "Hg	29.74						
Time Completed	54900						
Number of Rods	6						
Block Number	1						

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REDUCED DATA

Test Number	32
Date	4/21/92
Time Started	14:45
Number of Rods	0.00
Air Temperature, C	22.40
Liquid Temperature, C	20.70
Tank Level, meters	4.86
Barometric Pressure, Pa	99481
Time Completed	15:00
Number of Rods	0
Block Number	1

Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000
Gas Supply Flow, l/min	10.291	na	na
Vent Flow, liters/min	0.000	na	na
Inflation Time, minutes	0.733	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	32	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27866592...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	53100		volts	volts	volts	volts	seconds
Air Temperature, C	22.4	0	1.076	0.006878	-1	-1	44
Liquid Temperature, C	20.7	0	-1	-1	-1	-1	-1
Tank Level, inches	191.5	0	-1	-1	-1	-1	-1
Barometric Press., "Hg	29.46						
Time Completed	54000						
Number of Rods	0						
Block Number	1						

REDUCED DATA

Test Number	33
Date	4/21/92
Time Started	15:40
Air Temperature, C	22.70
Liquid Temperature, C	21.10
Tank Level, meters	4.86
Barometric Pressure, Pa	99413
Time Completed	15:50
Number of Rods	0
Block Number	1

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	na	na
Gas Supply Flow, l/min	24.864	na	na	na
Vent Flow, liters/min	na	na	na	na
Inflation Time, minutes	0.433	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	33	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27866592...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	56400		volts	volts	volts	volts	seconds
Air Temperature, C	22.7	0	2.598	0.01402	0.065478	0.016917	26
Liquid Temperature, C	21.1	-1	-1	-1	-1	-1	-1
Tank Level, inches	191.5	-1	-1	-1	-1	-1	-1
Barometric Press., "Hg	29.44						
Time Completed	57000						
Number of Rods	0						
Block Number	1						

REDUCED DATA

Test Number	34			
Date	4/21/92			
Time Started	15:50			
Number of Rods	0.00			
Air Temperature, C	22.20			
Liquid Temperature, C	21.10			
Tank Level, meters	4.86			
Barometric Pressure, Pa	99413			
Time Completed	#ERR			
Number of Rods	0			
Block Number	1			
	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000	0.2642
Gas Supply Flow, l/min	38.256	0.1523	0.2244	2.2417
Vent Flow, liters/min	1.314	0.1912	0.0447	2.0453
Inflation Time, minutes	0.628	na	0.0347	0.1494

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	34	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27866592...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	57000		volts	volts	volts	volts	seconds
Air Temperature, C	22.2	0	4.014	0.007453	0.0666	0.020469	40
Liquid Temperature, C	21.1	0	3.97	0.017488	0.070646	0.02067	36
Tank Level, inches	191.5	0	4.006	0.022785	0.076053	0.019741	37
Barometric Press., "Hg	29.44						
Time Completed	-1						
Number of Rods	0						
Block Number	1						

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REDUCED DATA

Test Number	35
Date	4/22/92
Time Started	10:25
Air Temperature, C	21.40
Liquid Temperature, C	20.60
Tank Level, meters	4.86
Barometric Pressure, Pa	100358
Time Completed	10:45
Number of Rods	0
Block Number	3

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	37.812	na	na	na
Gas Supply Flow, l/min	38.575	na	na	na
Vent Flow, liters/min	na	na	na	na
Inflation Time, minutes	0.300	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	35	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27867456...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	37500		volts	volts	volts	volts	seconds
Air Temperature, C	21.4	9.99	4.03	0.020148	-1	-1	18
Liquid Temperature, C	20.6	-1	-1	-1	-1	-1	-1
Tank Level, inches	191.5	-1	-1	-1	-1	-1	-1
Barometric Press., "Hg	29.72						
Time Completed	38700						
Number of Rods	0						
Block Number	3						

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REDUCED DATA

Test Number	36
Date	4/22/92
Time Started	13:00
Air Temperature, C	22.30
Liquid Temperature, C	20.80
Tank Level, meters	4.86
Barometric Pressure, Pa	100358
Time Completed	13:15
Number of Rods	0
Block Number	3

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	37.812	na	na	na
Gas Supply Flow, l/min	38.719	na	na	na
Vent Flow, liters/min	na	na	na	na
Inflation Time, minutes	0.250	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	36	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27867456...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	46800		volts	volts	volts	volts	seconds
Air Temperature, C	22.3	9.99	4.045	0.010114	-1	-1	15
Liquid Temperature, C	20.8	-1	-1	-1	-1	-1	-1
Tank Level, inches	191.5	-1	-1	-1	-1	-1	-1
Barometric Press., "Hg	29.72						
Time Completed	47700						
Number of Rods	0						
Block Number	3						

REDUCED DATA

Test Number	37
Date	4/22/92
Time Started	12:30
Air Temperature, C	22.50
Liquid Temperature, C	20.80
Tank Level, meters	4.86
Barometric Pressure, Pa	100392
Time Completed	13:00
Number of Rods	0
Block Number	3

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	37.951	na	0.2404	1.0676
Gas Supply Flow, l/min	38.751	0.1869	0.1134	2.0923
Vent Flow, liters/min	1.189	0.1470	0.0156	2.0226
Inflation Time, minutes	1.017	na	0.0333	0.1433

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	37	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27867456...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	45000		volts	volts	volts	volts	seconds
Air Temperature, C	22.5	9.99	4.041	0.023253	0.057339	0.016032	61
Liquid Temperature, C	20.8	9.99	4.062	0.021112	0.056649	0.015886	63
Tank Level, inches	191.5	10.1	4.042	0.014208	0.059805	0.01489	59
Barometric Press., "Hg	29.73						
Time Completed	46800						
Number of Rods	0						
Block Number	3						

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REDUCED DATA

Test Number	38
Date	3/23/92
Time Started	14:25
Air Temperature, C	22.90
Liquid Temperature, C	20.40
Tank Level, meters	4.86
Barometric Pressure, Pa	100494
Time Completed	14:45
Number of Rods	0
Block Number	4

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	56.662	na	0.0000	0.2642
Gas Supply Flow, l/min	39.044	0.1655	0.2087	2.2172
Vent Flow, liters/min	0.863	0.0000	0.0000	2.0000
Inflation Time, minutes	> 10	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	38	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27841536...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	51900		volts	volts	volts	volts	seconds
Air Temperature, C	22.9	14.97	4.054	0.026292	0.023276	0.000001049	-10
Liquid Temperature, C	20.4	14.97	4.089	0.014162	0.023277	0.000001227	-1
Tank Level, inches	191.5	14.97	4.094	0.011412	0.023275	0.000001378	-1
Barometric Press., "Hg	29.76						
Time Completed	53100						
Number of Rods	0						
Block Number	4						

REDUCED DATA

Test Number	39
Date	4/23/92
Time Started	14:45
Air Temperature, C	23.00
Liquid Temperature, C	20.50
Tank Level, meters	4.87
Barometric Pressure, Pa	100460
Time Completed	15:10
Number of Rods	0
Block Number	4

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	37.812	na	0.0000	0.2642
Gas Supply Flow, l/min	39.073	0.1812	0.1449	2.1261
Vent Flow, liters/min	0.863	0.0000	0.0000	2.0000
Inflation Time, minutes	> 10	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	39	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27868320...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	53100		volts	volts	volts	volts	seconds
Air Temperature, C	23	9.99	4.087	0.019768	0.023274	0.000001003	-10
Liquid Temperature, C	20.5	9.99	4.094	0.017681	0.023281	0.000007086	-1
Tank Level, inches	191.75	9.99	4.065	0.019329	0.023281	0.000001062	-1
Barometric Press., "Hg	29.75						
Time Completed	54600						
Number of Rods	0						
Block Number	4						

REDUCED DATA

Test Number	40
Date	4/23/92
Time Started	15:10
Air Temperature, C	23.20
Liquid Temperature, C	20.50
Tank Level, meters	4.86
Barometric Pressure, Pa	100426
Time Completed	15:35
Number of Rods	0
Block Number	4

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	37.509	na	0.2622	1.1588
Gas Supply Flow, l/min	10.036	0.0713	0.0826	2.0363
Vent Flow, liters/min	0.863	0.0000	0.0000	2.0000
Inflation Time, minutes	> 10	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	40	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27868320...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	54600		volts	volts	volts	volts	seconds
Air Temperature, C	23.2	9.99	1.04	0.007726	0.023279	0.000001089	-10
Liquid Temperature, C	20.5	9.87	1.057	0.007366	0.023277	0.000001018	-1
Tank Level, inches	191.5	9.87	1.051	0.007235	0.023278	0.0000009915	-1
Barometric Press., "Hg	29.74						
Time Completed	56100						
Number of Rods	0						
Block Number	4						

REDUCED DATA

Test Number	41
Date	4/23/92
Time Started	15:35
Air Temperature, C	23.10
Liquid Temperature, C	20.70
Tank Level, meters	4.86
Barometric Pressure, Pa	100392
Time Completed	16:03
Number of Rods	0
Block Number	4

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	56.649	na	0.1530	0.7094
Gas Supply Flow, l/min	10.036	0.0734	0.0442	2.0144
Vent Flow, liters/min	0.863	0.0000	0.0000	2.0000
Inflation Time, minutes	> 10	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	41	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27868320...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	56100		volts	volts	volts	volts	seconds
Air Temperature, C	23.1	14.92	1.044	0.007873	0.023277	0.000001144	-10
Liquid Temperature, C	20.7	14.99	1.052	0.007965	0.023278	0.00000103	-1
Tank Level, inches	191.5	14.99	1.052	0.007169	0.023276	0.0000009718	-1
Barometric Press., "Hg	29.73						
Time Completed	57780						
Number of Rods	0						
Block Number	4						

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REDUCED DATA

Test Number	42
Date	4/24/92
Time Started	08:55
Air Temperature, C	20.90
Liquid Temperature, C	na
Tank Level, meters	4.86
Barometric Pressure, Pa	100257
Time Completed	09:23
Number of Rods	0
Block Number	4

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000	0.2642
Gas Supply Flow, l/min	10.269	0.0657	0.0693	2.0264
Vent Flow, liters/min	0.863	0.0000	0.0001	2.0000
Inflation Time, minutes	> 10	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	42	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27869184...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	32100		volts	volts	volts	volts	seconds
Air Temperature, C	20.9	0	1.069	0.006225	0.023263	0.000001201	-10
Liquid Temperature, C	-1	0	1.082	0.006687	0.023273	0.000004704	-1
Tank Level, inches	191.5	0	1.07	0.007673	0.023273	0.000003161	-1
Barometric Press., "Hg	29.69						
Time Completed	33780						
Number of Rods	0						
Block Number	4						

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REDUCED DATA

Test Number	43
Date	4/24/92
Time Started	09:25
Air Temperature, C	22.50
Liquid Temperature, C	na
Tank Level, meters	4.86
Barometric Pressure, Pa	100223
Time Completed	09:45
Number of Rods	0
Block Number	4

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000	0.2642
Gas Supply Flow, l/min	25.630	0.1465	0.0479	2.0318
Vent Flow, liters/min	0.863	0.0001	0.0000	2.0000
Inflation Time, minutes	> 10	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	43	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27869184...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	33900		volts	volts	volts	volts	seconds
Air Temperature, C	22.5	0	2.683	0.010121	0.023271	0.00000903	-10
Liquid Temperature, C	-1	0	2.673	0.017717	0.023261	0.00001806	-1
Tank Level, inches	191.5	0	2.678	0.018074	0.023263	0.000013938	-1
Barometric Press., "Hg	29.68						
Time Completed	35100						
Number of Rods	0						
Block Number	4						

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REDUCED DATA

Test Number	44
Date	4/24/92
Time Started	09:45
Air Temperature, C	22.30
Liquid Temperature, C	na
Tank Level, meters	4.86
Barometric Pressure, Pa	100190
Time Completed	10:15
Number of Rods	0
Block Number	4

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000	0.2642
Gas Supply Flow, l/min	39.044	0.1719	0.1245	2.0989
Vent Flow, liters/min	0.863	0.1309	0.0000	2.0171
Inflation Time, minutes	> 10	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	44	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27869184...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	35100		volts	volts	volts	volts	seconds
Air Temperature, C	22.3	0	4.066	0.020554	0.023246	0.015692	-10
Liquid Temperature, C	-1	0	4.092	0.014673	0.023245	0.014088	-1
Tank Level, inches	191.5	0	4.079	0.018629	0.023244	0.011892	-1
Barometric Press., "Hg	29.67						
Time Completed	36900						
Number of Rods	0						
Block Number	4						

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REDUCED DATA

Test Number	45
Date	4/24/92
Time Started	14:50
Air Temperature, C	23.10
Liquid Temperature, C	21.20
Tank Level, meters	4.86
Barometric Pressure, Pa	99987
Time Completed	14:00
Number of Rods	0
Block Number	5

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000	0.2642
Gas Supply Flow, l/min	10.052	0.0656	0.0533	2.0174
Vent Flow, liters/min	0.915	0.2100	0.3904	2.6455
Inflation Time, minutes	0.467	na	0.0726	0.3124

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	45	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27869184...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	53400		volts	volts	volts	volts	seconds
Air Temperature, C	23.1	0	1.045	0.006375	0.0043437	0.018496	33
Liquid Temperature, C	21.2	0	1.052	0.008348	0.0053247	0.027104	25
Tank Level, inches	191.5	0	1.056	0.005824	0.076608	0.021267	26
Barometric Press., "Hg	29.61						
Time Completed	50400						
Number of Rods	0						
Block Number	5						

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REDUCED DATA

Test Number	46
Date	4/24/92
Time Started	14:45
Air Temperature, C	23.20
Liquid Temperature, C	21.50
Tank Level, meters	4.86
Barometric Pressure, Pa	99784
Time Completed	15:20
Number of Rods	0
Block Number	5

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000	0.2642
Gas Supply Flow, l/min	24.925	0.1424	0.0940	2.0603
Vent Flow, liters/min	1.280	0.1554	0.0187	2.0256
Inflation Time, minutes	0.639	na	0.0192	0.0827

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	46	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27869184...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	53100		volts	volts	volts	volts	seconds
Air Temperature, C	23.2	0	2.61	0.018226	0.067272	0.016158	39
Liquid Temperature, C	21.5	0	2.61	0.011016	0.065647	0.016374	37
Tank Level, inches	191.5	0	2.593	0.017362	0.069593	0.016951	39
Barometric Press., "Hg	29.55						
Time Completed	55200						
Number of Rods	0						
Block Number	5						

REDUCED DATA

Test Number	47
Date	4/24/92
Time Started	15:20
Air Temperature, C	23.20
Liquid Temperature, C	21.40
Tank Level, meters	4.86
Barometric Pressure, Pa	99717
Time Completed	15:50
Number of Rods	0
Block Number	5

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000	0.2642
Gas Supply Flow, l/min	39.163	0.1243	0.0544	2.0289
Vent Flow, liters/min	1.214	0.1908	0.0180	2.0376
Inflation Time, minutes	0.728	na	0.0752	0.3236

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	47	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27869184...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	55200		volts	volts	volts	volts	seconds
Air Temperature, C	23.2	0	4.093	0.011687	0.060796	0.019651	39
Liquid Temperature, C	21.4	0	4.096	0.010883	0.062257	0.020966	48
Tank Level, inches	191.5	0	4.085	0.016367	0.058467	0.020142	44
Barometric Press., "Hg	29.53						
Time Completed	57000						
Number of Rods	0						
Block Number	5						

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REDUCED DATA

Test Number	48
Date	4/27/92
Time Started	10:10
Air Temperature, C	20.80
Liquid Temperature, C	20.40
Tank Level, meters	4.86
Barometric Pressure, Pa	100156
Time Completed	11:00
Number of Rods	0
Block Number	6

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000	0.2642
Gas Supply Flow, l/min	10.109	0.0759	0.9623	4.6010
Vent Flow, liters/min	na	na	na	na
Inflation Time, minutes	0.417	na	0.0577	0.2483

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	48	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27871776...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	36600		volts	volts	volts	volts	seconds
Air Temperature, C	20.8	0	1.002	0.008765	-1	-1	23
Liquid Temperature, C	20.4	0	0.996	0.00883	-1	-1	29
Tank Level, inches	191.5	0	1.173	0.006179	-1	-1	23
Barometric Press., "Hg	29.66						
Time Completed	39600						
Number of Rods	0						
Block Number	6						

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REDUCED DATA

Test Number	49
Date	4/27/92
Time Started	11:40
Air Temperature, C	21.80
Liquid Temperature, C	20.60
Tank Level, meters	4.86
Barometric Pressure, Pa	100156
Time Completed	12:00
Number of Rods	0
Block Number	6

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000	0.2642
Gas Supply Flow, l/min	24.669	0.1297	0.0638	2.0354
Vent Flow, liters/min	na	na	na	na
Inflation Time, minutes	0.733	na	0.0289	0.1244

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	49	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27871776...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	42000		volts	volts	volts	volts	seconds
Air Temperature, C	21.8	0	2.585	0.020945	-1	-1	42
Liquid Temperature, C	20.6	0	2.576	0.007337	-1	-1	45
Tank Level, inches	191.5	0	2.572	0.012356	-1	-1	45
Barometric Press., "Hg	29.66						
Time Completed	43200						
Number of Rods	0						
Block Number	6						

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REDUCED DATA

Test Number	50
Date	4/27/92
Time Started	12:00
Air Temperature, C	21.60
Liquid Temperature, C	21.00
Tank Level, meters	4.86
Barometric Pressure, Pa	100156
Time Completed	12:15
Number of Rods	0
Block Number	6

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000	0.2642
Gas Supply Flow, l/min	39.839	0.0174	0.0948	2.3350
Vent Flow, liters/min	na	na	na	na
Inflation Time, minutes	0.861	na	0.0948	0.4079

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	50	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27871776...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	43200		volts	volts	volts	volts	seconds
Air Temperature, C	21.6	0	4.169	0.0018013	-1	-1	47
Liquid Temperature, C	21	0	4.155	0.0018286	-1	-1	50
Tank Level, inches	191.5	0	-1	-1	-1	-1	58
Barometric Press., "Hg	29.66						
Time Completed	44100						
Number of Rods	0						
Block Number	6						

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REDUCED DATA

Test Number	51
Date	4/27/92
Time Started	15:55
Air Temperature, C	21.60
Liquid Temperature, C	20.60
Tank Level, meters	4.86
Barometric Pressure, Pa	99953
Time Completed	16:20
Number of Rods	0
Block Number	7

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000	0.2642
Gas Supply Flow, l/min	9.844	0.0709	0.0241	2.0077
Vent Flow, liters/min	0.695	0.0000	0.0000	2.0000
Inflation Time, minutes	> 10	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	51	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27871776...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	57300		volts	volts	volts	volts	seconds
Air Temperature, C	21.6	0	1.027	0.009133	0.005492	0.0000008961	-10
Liquid Temperature, C	20.6	0	1.029	0.006738	0.005492	0.000001412	-1
Tank Level, inches	191.5	0	1.032	0.006353	0.005492	0.0000006884	-1
Barometric Press., "Hg	29.6						
Time Completed	58800						
Number of Rods	0						
Block Number	7						

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REDUCED DATA

Test Number	52
Date	4/28/92
Time Started	09:15
Air Temperature, C	20.30
Liquid Temperature, C	20.60
Tank Level, meters	4.86
Barometric Pressure, Pa	100055
Time Completed	09:40
Number of Rods	0
Block Number	7

	Average	Sigma 1	Sigma 2	Uncertainty
Liquid Flow, liters/min	0.000	na	0.0000	0.2642
Gas Supply Flow, l/min	39.501	0.1379	0.0553	2.0329
Vent Flow, liters/min	0.695	0.0000	0.0000	2.0000
Inflation Time, minutes	> 10	na	na	na

b	m	u
0.000000	3.7850	0.26420
-0.011584	9.5749	2.00000
0.643690	9.4213	2.00000
na	na	0.00333

RAW FIELD DATA

Test Number	52	Liquid Flow	Gas Supply	Gas Supply	Vent	Vent	Inflation
Date	27872640...	gpm	Flow	Sigma	Flow	Sigma	Time
Time Started	33300		volts	volts	volts	volts	seconds
Air Temperature, C	20.3	0	4.13	0.022634	0.005449	0.0000008582	-10
Liquid Temperature, C	20.6	0	4.12	0.011739	0.005458	0.000001582	-1
Tank Level, inches	191.5	0	4.13	0.008823	0.005453	0.000001225	-1
Barometric Press., "Hg	29.63						
Time Completed	34800						
Number of Rods	0						
Block Number	7						

Appendix D
Original Test Matrix

Original Test Matrix			
Test Number	Liquid Flow Rate gpm	Gas Flow Rate lpm	Number of Rods Inserted
1	10.0	10.0	6
2	15.0	40.0	6
3	10.0	10.0	6
4	15.0	40.0	6
5	15.0	10.0	6
6	12.5	25.0	6
7	10.0	40.0	6
8	10.0	40.0	6
9	12.5	25.0	6
10	15.0	10.0	6
11	10.0	40.0	3
12	12.5	25.0	3
13	15.0	10.0	3
14	10.0	40.0	3
15	15.0	40.0	3
16	10.0	10.0	3
17	15.0	40.0	3
18	15.0	10.0	3
19	12.5	25.0	3
20	10.0	10.0	3
21	15.0	40.0	0
22	10.0	40.0	0
23	10.0	40.0	0
24	15.0	40.0	0
25	10.0	10.0	0
26	10.0	10.0	0
27	15.0	10.0	0
28	12.5	25.0	0
29	15.0	10.0	0
30	12.5	25.0	0

DATE

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4/28/94

END