228
6/2/75
ANCR-1198

1357 ~~1357~~
UC-78a

EXPERIMENT DATA REPORT FOR SEMISCALE
MOD-1 TEST S-01-1
(ISOTHERMAL BLOWDOWN WITH CORE RESISTANCE SIMULATOR)

S.N. Zender

H.S. Crapo

M.F. Jensen

K.E. Sackett

MASTER

Aerojet Nuclear Company

IDAHO NATIONAL ENGINEERING LABORATORY

Idaho Falls, Idaho — 83401

DATE PUBLISHED - APRIL 1975

PREPARED FOR THE

ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

IDAHO OPERATIONS OFFICE UNDER CONTRACT AT(10-1)-1375

DISTRIBUTION OF THIS DOCUMENT UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency Thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

Printed in the United States of America
Available from
National Technical Information Service
U. S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161
Price: Printed Copy \$7.60; Microfiche \$2.25

LEGAL NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the Energy Research and Development Administration, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

EXPERIMENT DATA REPORT FOR SEMISCALE MOD-1

TEST S-01-1

(Isothermal Blowdown with Core Resistance Simulator)

by

S. N. Zender
H. S. Crapo
M. F. Jensen
K. E. Sackett

AEROJET NUCLEAR COMPANY

NOTICE
This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Energy Research and Development Administration, nor any of their employees, nor any of their contractors, subcontractors, or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information, apparatus, product or process disclosed, or represents that its use would not infringe privately owned rights.

Date Published - April 1975

MASTER

PREPARED FOR THE
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
IDAHO OPERATIONS OFFICE
UNDER CONTRACT NO. AT(10-1)-1375

DISTRIBUTION OF THIS DOCUMENT UNLIMITED

ABSTRACT

Recorded test data are presented for Test S-01-1 of the semiscale Mod-1 isothermal blowdown test series. Test S-01-1 is one of several semiscale Mod-1 experiments which are counterparts of the planned Loss-of-Fluid Test (LOFT) nonnuclear experiments. System hardware is representative of the LOFT design, selected using volumetric scaling methods, and initial conditions duplicate those identified for the LOFT nonnuclear tests.

Test S-01-1 was conducted from an initial temperature of 540°F and an initial pressure of 1596 psig. A simulated intermediate size double-ended hot leg break (0.00145 ft² break area on each end) was used to investigate the system response to a slow depressurization transient. An orificed structure was used in the pressure vessel to simulate the LOFT core simulator. During system depressurization, coolant was injected into the vessel downcomer inlet annulus to investigate the effectiveness of injection into the inlet annulus with respect to delivery of coolant to the lower plenum. Following the blowdown portion of Test S-01-1, coolant spray was introduced into the pressure suppression tank to determine the response of the pressure suppression system.

The purpose of this report is to make available the uninterpreted data from Test S-01-1 for future data analysis and test results reporting activities. The data, presented in the form of graphs in engineering units, have been analyzed only to the extent necessary to assure that they are reasonable and consistent.

SUMMARY

Test S-01-1 was performed as part of the semiscale Mod-1 portion of the Semiscale Blowdown and Emergency Core Cooling (ECC) Project conducted by Aerojet Nuclear Company for the United States Energy Research and Development Administration. This test was one of the semiscale Mod-1 tests in Test Group 1 performed with hardware configuration and test parameters selected to yield a system response that simulates the Loss-of-Fluid Test (LOFT) system response during the LOFT nonnuclear blowdown experiments. Test S-01-1 utilized a pressure vessel with internals; an intact loop with active pump, steam generator, and pressurizer; a broken loop with simulated pump, simulated steam generator, and rupture assemblies; a pressure suppression system with header and pressure suppression tank; and a coolant injection system with low-pressure injection pumps, high-pressure injection pumps, and accumulators. An orificed structure was used in the core barrel of the pressure vessel to simulate the flow resistance of the core simulator to be used in the LOFT nonnuclear tests.

The overall objective of the semiscale program is to provide data for use in the development and verification of analytical models that are used to predict the transient thermal-hydraulic response of a water-cooled nuclear reactor system during a hypothetical loss-of-coolant accident (LOCA). The semiscale Mod-1 program has the further general objective of providing support to other experimental programs in the form of instrumentation assessment, optimization of test series, selection of test parameters, and evaluation of test results.

The areas of interest specific to Test S-01-1 were the effects of slow depressurization (especially on pump coastdown) and the influence of hot downcomer walls on delivery of coolant to the lower plenum. In order to establish the importance of the depressurization rate, Test S-01-1 was conducted from an initial pressure of 1596 psig with an intermediate size simulated hot leg break (0.00290 ft^2). The delay time before coolant is delivered to the lower plenum was studied by injecting coolant into the downcomer inlet annulus during the entire blowdown transient.

The recorded initial isothermal conditions of 1596 psig and 540°F were within acceptable bounds to allow analysis of the test data. An instantaneous offset shear of the broken loop hot leg piping was satisfactorily simulated by almost simultaneous (within 10 milliseconds) actuation of the rupture assemblies. The instrumentation used for Test S-01-1 generally functioned as intended. Of about 200 measurements attempted, all but 10 produced usable data.

CONTENTS

ABSTRACT	ii
SUMMARY	iii
I. INTRODUCTION	1
II. SYSTEM, PROCEDURES, CONDITIONS, AND EVENTS FOR TEST S-01-1	3
1. SYSTEM CONFIGURATION AND TEST PROCEDURES	3
2. INITIAL TEST CONDITIONS AND SEQUENCE OF EVENTS	6
III. DATA PRESENTATION	11
IV. REFERENCES	160

FIGURES

1. Semiscale Mod-1 system and instrumentation for hot leg break configuration -- isometric	4
2. Semiscale Mod-1 system and instrumentation for hot leg break configuration -- schematic	5
3. Semiscale Mod-1 pressure vessel -- cross section showing instrumentation	12
4. Semiscale Mod-1 pressure vessel -- isometric showing instrumentation	13
5. Semiscale Mod-1 pressure vessel -- penetrations and instrumentation	14
6. Fluid temperatures in intact loop from -2 to 110 seconds	26
7. Fluid temperatures in intact loop from -2 to 30 seconds	26
8. Fluid temperatures in broken loop from -2 to 110 seconds	27
9. Fluid temperatures in broken loop from -2 to 30 seconds	27

10.	Fluid temperatures in inlet annulus from -2 to 110 seconds	28
11.	Fluid temperatures in inlet annulus from -2 to 30 seconds	28
12.	Fluid temperatures in downcomer annulus (TFV-ANN-15A, TFV-ANN-15M, and TFV-ANN-15T) from -2 to 110 seconds	29
13.	Fluid temperatures in downcomer annulus (TFV-ANN-15A, TFV-ANN-15M, and TFV-ANN-15T) from -2 to 30 seconds	29
14.	Fluid temperatures in downcomer annulus (TFV-ANN-35A, TFV-ANN-35M, and TFV-ANN-35T) from -2 to 110 seconds	30
15.	Fluid temperatures in downcomer annulus (TFV-ANN-35A, TFV-ANN-35M, and TFV-ANN-35T) from -2 to 30 seconds	30
16.	Fluid temperatures in downcomer annulus (TFV-ANN-70A, TFV-ANN-115A, and TFV-ANN-156A) from -2 to 110 seconds	31
17.	Fluid temperatures in downcomer annulus (TFV-ANN-70A, TFV-ANN-115A, and TFV-ANN-156A) from -2 to 30 seconds	31
18.	Fluid temperatures in lower plenum from -2 to 110 seconds	32
19.	Fluid temperatures in lower plenum from -2 to 30 seconds	32
20.	Fluid temperature in core (LOFT) from -2 to 110 seconds	33
21.	Fluid temperature in core (LOFT) from -2 to 30 seconds	33
22.	Fluid temperatures in core barrel insulation gap from -2 to 110 seconds	34
23.	Fluid temperatures in core barrel insulation gap from -2 to 30 seconds	34
24.	Fluid temperatures in vessel filler insulation gap from -2 to 110 seconds	35
25.	Fluid temperatures in vessel filler insulation gap from -2 to 30 seconds	35
26.	Fluid temperatures in steam generator from -2 to 110 seconds	36
27.	Fluid temperatures in steam generator from -2 to 30 seconds	36

28.	Fluid temperature in pressurizer surge line from -2 to 110 seconds	37
29.	Fluid temperature in pressurizer surge line from -2 to 30 seconds	37
30.	Fluid temperatures in pressure suppression tank from -2 to 110 seconds	38
31.	Fluid temperatures in pressure suppression tank from -2 to 30 seconds	38
32.	Material temperatures in intact loop (TMU-1S16, TMU-1B16, TMU-5B16, and TMU-7S16) from -2 to 110 seconds	39
33.	Material temperatures in intact loop (TMU-1S16, TMU-1B16, TMU-5B16, and TMU-7S16) from -2 to 30 seconds	39
34.	Material temperatures in intact loop (TMU-8S16, TMU-10S16, TMU-15T16, and TMU-15B16) from -2 to 110 seconds	40
35.	Material temperatures in intact loop (TMU-8S16, TMU-10S16, TMU-15T16, and TMU-15B16) from -2 to 30 seconds	40
36.	Material temperatures in broken loop from -2 to 110 seconds	41
37.	Material temperatures in broken loop from -2 to 30 seconds	41
38.	Material temperatures in vessel wall from -2 to 110 seconds	42
39.	Material temperatures in vessel wall from -2 to 30 seconds	42
40.	Material temperatures in vessel filler outside diameter from -2 to 110 seconds	43
41.	Material temperatures in vessel filler outside diameter from -2 to 30 seconds	43
42.	Material temperatures in vessel filler inside diameter (TMV-FI-4M, TMV-FI-15A, TMV-FI-35A, and TMV-FI-35M) from -2 to 110 seconds	44
43.	Material temperatures in vessel filler inside diameter (TMV-FI-4M, TMV-FI-15A, TMV-FI-35A, and TMV-FI-35M) from -2 to 30 seconds	44
44.	Material temperatures in vessel filler inside diameter (TMV-FI-70A, TMV-FI-115A, TMV-FI-156A, TMV-FI-156M, and TMV-FI-177M) from -2 to 110 seconds	45

45.	Material temperatures in vessel filler inside diameter (TMV-FI-70A, TMV-FI-115A, TMV-FI-156A, TMV-FI-156M, and TMV-FI-177M) from -2 to 30 seconds	45
46.	Material temperatures in vessel filler insulator from -2 to 110 seconds	46
47.	Material temperatures in vessel filler insulator from -2 to 30 seconds	46
48.	Material temperature in vessel lower head from -2 to 110 seconds	47
49.	Material temperature in vessel lower head from -2 to 30 seconds	47
50.	Material temperatures in core barrel outside diameter (TMV-CO-4A, TMV-CO-15A, TMV-CO-70A, TMV-CO-115A, and TMV-CO-115M) from -2 to 110 seconds	48
51.	Material temperatures in core barrel outside diameter (TMV-CO-4A, TMV-CO-15A, TMV-CO-70A, TMV-CO-115A, and TMV-CO-115M) from -2 to 30 seconds	48
52.	Material temperatures in core barrel inside diameter (TMV-CI-70A and TMV-CI-115A) from -2 to 110 seconds	49
53.	Material temperatures in core barrel inside diameter (TMV-CI-70A and TMV-CI-115A) from -2 to 30 seconds	49
54.	Material temperatures in steam generator from -2 to 110 seconds	50
55.	Material temperatures in steam generator from -2 to 30 seconds	50
56.	Pressures in broken loop hot leg vessel side of break from -2 to 110 seconds	51
57.	Pressures in broken loop hot leg vessel side of break from -2 to 30 seconds	51
58.	Pressures in broken loop hot leg pump side of break from -2 to 110 seconds	52
59.	Pressures in broken loop hot leg pump side of break from -2 to 30 seconds	52

60.	Pressures in vessel from -2 to 110 seconds	53
61.	Pressures in vessel from -2 to 30 seconds	53
62.	Pressure in intact loop ECC accumulator from -2 to 110 seconds	54
63.	Pressure in pressurizer from -2 to 110 seconds	55
64.	Pressure in pressurizer from -2 to 30 seconds	55
65.	Pressure in pressure suppression tank from -2 to 110 seconds	56
66.	Pressure in pressure suppression tank from -2 to 30 seconds	56
67.	Differential pressure in intact loop (upper plenum to Spool 1) from -2 to 110 seconds	57
68.	Differential pressure in intact loop (upper plenum to Spool 1) from -2 to 30 seconds	57
69.	Differential pressure in intact loop (upper plenum to Spool 3) from -2 to 110 seconds	58
70.	Differential pressure in intact loop (upper plenum to Spool 3) from -2 to 30 seconds	58
71.	Differential pressure in intact loop (Spool 3 to Spool 7) from -2 to 110 seconds	59
72.	Differential pressure in intact loop (Spool 3 to Spool 7) from -2 to 30 seconds	59
73.	Differential pressure in intact loop, low range (Spool 3 to Spool 7) from -2 to 110 seconds	60
74.	Differential pressure in intact loop, low range (Spool 3 to Spool 7) from -2 to 30 seconds	60
75.	Differential pressure in intact loop (Spool 3 to steam generator inlet plenum) from -2 to 110 seconds	61
76.	Differential pressure in intact loop (Spool 3 to steam generator inlet plenum) from -2 to 30 seconds	61
77.	Differential pressure in intact loop (Spool 6 to steam generator inlet plenum) from -2 to 110 seconds	62

78.	Differential pressure in intact loop (Spool 6 to steam generator inlet plenum) from -2 to 30 seconds	62
79.	Differential pressure in intact loop (SG1 to SG2) from -2 to 110 seconds	63
80.	Differential pressure in intact loop (SG1 to SG2) from -2 to 30 seconds	63
81.	Differential pressure in intact loop (steam generator outlet plenum to Spool 7) from -2 to 110 seconds	64
82.	Differential pressure in intact loop (steam generator outlet plenum to Spool 7) from -2 to 30 seconds	64
83.	Differential pressure in intact loop (Spool 7 to Spool 10) from -2 to 110 seconds	65
84.	Differential pressure in intact loop (Spool 7 to Spool 10) from -2 to 30 seconds	65
85.	Differential pressure in intact loop (Spool 8C to Spool 8D) from -2 to 110 seconds	66
86.	Differential pressure in intact loop (Spool 8C to Spool 8D) from -2 to 30 seconds	66
87.	Differential pressure in intact loop (Spool 8D to Spool 8E) from -2 to 110 seconds	67
88.	Differential pressure in intact loop (Spool 8D to Spool 8E) from -2 to 30 seconds	67
89.	Differential pressure in intact loop (Spool 12 to Spool 10) from -2 to 110 seconds	68
90.	Differential pressure in intact loop (Spool 12 to Spool 10) from -2 to 30 seconds	68
91.	Differential pressure in intact loop, low range (Spool 12 to Spool 10) from -2 to 110 seconds	69
92.	Differential pressure in intact loop, low range (Spool 12 to Spool 10) from -2 to 30 seconds	69

93.	Differential pressure in intact loop (Spool 12 to Spool 15) from -2 to 110 seconds	70
94.	Differential pressure in intact loop (Spool 12 to Spool 15) from -2 to 30 seconds	70
95.	Differential pressure in intact loop (Spool 15 to Spool 1) from -2 to 110 seconds	71
96.	Differential pressure in intact loop (Spool 15 to Spool 1) from -2 to 30 seconds	71
97.	Differential pressure in intact loop, low range (Spool 15 to Spool 1) from -2 to 110 seconds	72
98.	Differential pressure in intact loop, low range (Spool 15 to Spool 1) from -2 to 30 seconds	72
99.	Differential pressure in intact loop (Spool 15 to vessel inlet annulus) from -2 to 110 seconds	73
100.	Differential pressure in intact loop (Spool 15 to vessel inlet annulus) from -2 to 30 seconds	73
101.	Differential pressure in intact loop (Spool 15 to atmosphere) from -2 to 110 seconds	74
102.	Differential pressure in intact loop (pressurizer liquid level) from -2 to 110 seconds	75
103.	Differential pressure in intact loop (pressurizer liquid level) from -2 to 30 seconds	75
104.	Differential pressure in broken loop (vessel upper plenum to Spool 21A) from -2 to 110 seconds	76
105.	Differential pressure in broken loop (vessel upper plenum to Spool 21A) from -2 to 30 seconds	76
106.	Differential pressure in broken loop (Spool 21A to Spool 23) from -2 to 110 seconds	77
107.	Differential pressure in broken loop (Spool 21A to Spool 23) from -2 to 30 seconds	77

108. Differential pressure in broken loop (Spool 23 to vessel-side nozzle throat) from -2 to 110 seconds	78
109. Differential pressure in broken loop (Spool 23 to vessel-side nozzle throat) from -2 to 30 seconds	78
110. Differential pressure in broken loop (vessel-side nozzle throat to divergent section) from -2 to 110 seconds	79
111. Differential pressure in broken loop (vessel-side nozzle throat to divergent section) from -2 to 30 seconds	79
112. Differential pressure in broken loop (Spool 23 to Spool 24) from -2 to 110 seconds	80
113. Differential pressure in broken loop (Spool 23 to Spool 24) from -2 to 30 seconds	80
114. Differential pressure in broken loop (vessel inlet annulus to Spool 30) from -2 to 110 seconds	81
115. Differential pressure in broken loop (vessel inlet annulus to Spool 30) from -2 to 30 seconds	81
116. Differential pressure in broken loop (Spool 30 to Spool 40) from -2 to 110 seconds	82
117. Differential pressure in broken loop (Spool 30 to Spool 40) from -2 to 30 seconds	82
118. Differential pressure in broken loop (Spool 40 to Spool 38) from -2 to 110 seconds	83
119. Differential pressure in broken loop (Spool 40 to Spool 38) from -2 to 30 seconds	83
120. Differential pressure in broken loop, low range (Spool 40 to Spool 38) from -2 to 110 seconds	84
121. Differential pressure in broken loop (Spool 38 to Spool 36U) from -2 to 110 seconds	85
122. Differential pressure in broken loop (Spool 38 to Spool 36U) from -2 to 30 seconds	85

123. Differential pressure in broken loop (Spool 37 to Spool 36U) from -2 to 110 seconds	86
124. Differential pressure in broken loop (Spool 37 to Spool 36U) from -2 to 30 seconds	86
125. Differential pressure in broken loop (Spool 37 to Spool 42) from -2 to 110 seconds	87
126. Differential pressure in broken loop (Spool 37 to Spool 42) from -2 to 30 seconds	87
127. Differential pressure in broken loop (Spool 36U to Spool 32L) from -2 to 110 seconds	88
128. Differential pressure in broken loop (Spool 36U to Spool 32L) from -2 to 30 seconds	88
129. Differential pressure in broken loop (Spool 42 to Spool 43) from -2 to 110 seconds	89
130. Differential pressure in broken loop (Spool 42 to Spool 43) from -2 to 30 seconds	89
131. Differential pressure in broken loop (Spool 42 to pump-side nozzle throat) from -2 to 110 seconds	90
132. Differential pressure in broken loop (Spool 42 to pump-side nozzle throat) from -2 to 30 seconds	90
133. Differential pressure in broken loop (pump-side nozzle throat to divergent section) from -2 to 110 seconds	91
134. Differential pressure in broken loop (pump-side nozzle throat to divergent section) from -2 to 30 seconds	91
135. Differential pressure in broken loop (pump-side nozzle divergent section to Spool 43) from -2 to 110 seconds	92
136. Differential pressure in broken loop (pump-side nozzle divergent section to Spool 43) from -2 to 30 seconds	92
137. Differential pressure in vessel (upper plenum to inlet annulus) from -2 to 110 seconds	93

138. Differential pressure in vessel (upper plenum to inlet annulus) from -2 to 30 seconds	93
139. Differential pressure in vessel (DPV-9-26QQ) from -2 to 110 seconds	94
140. Differential pressure in vessel (DPV-9-26QQ) from -2 to 30 seconds	94
141. Differential pressure in vessel (DPV-9-180QQ) from -2 to 110 seconds	95
142. Differential pressure in vessel (DPV-9-180QQ) from -2 to 30 seconds	95
143. Differential pressure in vessel (DPV-26-55QM) from -2 to 110 seconds	96
144. Differential pressure in vessel (DPV-26-55QM) from -2 to 30 seconds	96
145. Differential pressure in vessel (DPV-55-110AM) from -2 to 110 seconds	97
146. Differential pressure in vessel (DPV-55-110AM) from -2 to 30 seconds	97
147. Differential pressure in vessel (DPV-110-156MQ) from -2 to 110 seconds	98
148. Differential pressure in vessel (DPV-110-156MQ) from -2 to 30 seconds	98
149. Differential pressure in vessel (DPV-156-173QQ) from -2 to 110 seconds	99
150. Differential pressure in vessel (DPV-156-173QQ) from -2 to 30 seconds	99
151. Differential pressure in vessel (DPV-166-173QQ) from -2 to 110 seconds	100
152. Differential pressure in vessel (DPV-166-173QQ) from -2 to 30 seconds	100

153. Differential pressure in vessel (DPV-166-191QT) from -2 to 110 seconds	101
154. Differential pressure in vessel (DPV-166-191QT) from -2 to 30 seconds	101
155. Differential pressure in steam generator secondary (secondary liquid level) from -2 to 110 seconds	102
156. Differential pressure in steam generator secondary (secondary liquid level) from -2 to 30 seconds	102
157. Volumetric flows in intact loop (FTU-1 and FTU-9) from -2 to 110 seconds	103
158. Volumetric flows in intact loop (FTU-1 and FTU-9) from -2 to 30 seconds	103
159. Volumetric flows in intact loop (FTU-13 and FTU-15) from -2 to 110 seconds	104
160. Volumetric flows in intact loop (FTU-13 and FTU-15) from -2 to 30 seconds	104
161. Volumetric flows in broken loop (FTB-21A, FTB-30, and FTB-37) from -2 to 110 seconds	105
162. Volumetric flows in broken loop (FTB-21A, FTB-30, and FTB-37) from -2 to 30 seconds	105
163. Volumetric flow in core entrance from -2 to 110 seconds	106
164. Volumetric flow in core entrance from -2 to 30 seconds	106
165. Volumetric flow from high-pressure injection system from -2 to 110 seconds	107
166. Volumetric flow from high-pressure injection system from -2 to 30 seconds	107
167. Volumetric flow from low-pressure injection system from -2 to 110 seconds	108
168. Volumetric flow from intact loop accumulator from -2 to 110 seconds	109

169. Volumetric flow from pressurizer from -2 to 110 seconds	110
170. Volumetric flow from pressurizer from -2 to 30 seconds	110
171. Volumetric flow from pressure suppression spray system from -2 to 110 seconds	111
172. Fluid velocity in vessel (FTV-22M) from -2 to 110 seconds	112
173. Fluid velocity in vessel (FTV-22M) from -2 to 30 seconds	112
174. Fluid velocity in vessel (FTV-40A) from -2 to 110 seconds	113
175. Fluid velocity in vessel (FTV-40A) from -2 to 30 seconds	113
176. Fluid velocity in vessel (FTV-40M) from -2 to 110 seconds	114
177. Fluid velocity in vessel (FTV-40M) from -2 to 30 seconds	114
178. Fluid velocity in vessel (FTV-83A) from -2 to 110 seconds	115
179. Fluid velocity in vessel (FTV-83A) from -2 to 30 seconds	115
180. Fluid velocity in vessel (FTV-83M) from -2 to 110 seconds	116
181. Fluid velocity in vessel (FTV-83M) from -2 to 30 seconds	116
182. Momentum flux in intact loop (Spool 1) from -2 to 110 seconds	117
183. Momentum flux in intact loop (Spool 1) from -2 to 30 seconds	117
184. Momentum flux in intact loop (Spool 5) from -2 to 110 seconds	118
185. Momentum flux in intact loop (Spool 5) from -2 to 30 seconds	118
186. Momentum flux in intact loop (Spool 10) from -2 to 110 seconds	119
187. Momentum flux in intact loop (Spool 10) from -2 to 30 seconds	119
188. Momentum flux in intact loop (Spool 13) from -2 to 110 seconds	120
189. Momentum flux in intact loop (Spool 13) from -2 to 30 seconds	120
190. Momentum flux in intact loop (Spool 15) from -2 to 110 seconds	121

191. Momentum flux in intact loop (Spool 15) from -2 to 30 seconds	121
192. Momentum flux in broken loop (Spool 21A) from -2 to 110 seconds.	122
193. Momentum flux in broken loop (Spool 21A) from -2 to 30 seconds	122
194. Momentum flux in broken loop (Spool 23) from -2 to 110 seconds	123
195. Momentum flux in broken loop (Spool 23) from -2 to 30 seconds	123
196. Momentum flux in broken loop (Spool 37) from -2 to 110 seconds	124
197. Momentum flux in broken loop (Spool 37) from -2 to 30 seconds	124
198. Momentum flux in broken loop (Spool 42) from -2 to 110 seconds	125
199. Momentum flux in broken loop (Spool 42) from -2 to 30 seconds	125
200. Momentum flux in core entrance from -2 to 110 seconds	126
201. Momentum flux in core entrance from -2 to 30 seconds	126
202. Densities in intact loop (GU-1VR and GU-1HZ) from -2 to 110 seconds	127
203. Densities in intact loop (GU-1VR and GU-1HZ) from -2 to 30 seconds	127
204. Densities in intact loop (GU-5VR and GU-10VR) from -2 to 110 seconds	128
205. Densities in intact loop (GU-5VR and GU-10VR) from -2 to 30 seconds	128
206. Density in intact loop (GU-13VR) from -2 to 110 seconds	129
207. Density in intact loop (GU-13VR) from -2 to 30 seconds	129
208. Densities in intact loop (GU-15VR and GU-15HZ) from -2 to 110 seconds	130
209. Densities in intact loop (GU-15VR and GU-15HZ) from -2 to 30 seconds	130

210. Densities in broken loop (GB-21AVR and GB-23VR) from -2 to 110 seconds	131
211. Densities in broken loop (GB-21AVR and GB-23VR) from -2 to 30 seconds	131
212. Densities in broken loop (GB-30VR and GB-42VR) from -2 to 110 seconds	132
213. Densities in broken loop (GB-30VR and GB-42VR) from -2 to 30 seconds	132
214. Densities in vessel (GV-COR-150HZ and GV-161/192D) from -2 to 110 seconds	133
215. Densities in vessel (GV-COR-150HZ and GV-161/192D) from -2 to 30 seconds	133
216. Density in vessel (GVLP-172HZ) from -2 to 110 seconds	134
217. Density in vessel (GVLP-172HZ) from -2 to 30 seconds	134
218. Density in pressurizer from -2 to 110 seconds	135
219. Density in pressurizer from -2 to 30 seconds	135
220. Mass flow in intact loop (FDU-1 and GU-1VR) from -2 to 110 seconds	136
221. Mass flow in intact loop (FDU-1 and GU-1VR) from -2 to 30 seconds	136
222. Mass flow in intact loop (FTU-1 and GU-1VR) from -2 to 110 seconds	137
223. Mass flow in intact loop (FTU-1 and GU-1VR) from -2 to 30 seconds	137
224. Mass flow from pressurizer from -2 to 110 seconds	138
225. Mass flow from pressurizer from -2 to 30 seconds	138
226. Mass flow in intact loop (FDU-5 and GU-5VR) from -2 to 110 seconds	139

227. Mass flow in intact loop (FDU-5 and GU-5VR) from -2 to 30 seconds	139
228. Mass flow in intact loop (FDU-10 and GU-10VR) from -2 to 110 seconds	140
229. Mass flow in intact loop (FDU-10 and GU-10VR) from -2 to 30 seconds	140
230. Mass flow in intact loop (FDU-13 and GU-13VR) from -2 to 110 seconds	141
231. Mass flow in intact loop (FDU-13 and GU-13VR) from -2 to 30 seconds	141
232. Mass flow in intact loop (FTU-13 and GU-13VR) from -2 to 110 seconds	142
233. Mass flow in intact loop (FTU-13 and GU-13VR) from -2 to 30 seconds	142
234. Mass flow in intact loop (FDU-15 and GU-15VR) from -2 to 110 seconds	143
235. Mass flow in intact loop (FDU-15 and GU-15VR) from -2 to 30 seconds	143
236. Mass flow in intact loop (FTU-15 and GU-15VR) from -2 to 110 seconds	144
237. Mass flow in intact loop (FTU-15 and GU-15VR) from -2 to 30 seconds	144
238. Mass flow in broken loop (FDB-21A and GB-21AVR) from -2 to 110 seconds	145
239. Mass flow in broken loop (FDB-21A and GB-21AVR) from -2 to 30 seconds	145
240. Mass flow in broken loop (FTB-21A and GB-21AVR) from -2 to 110 seconds	146
241. Mass flow in broken loop (FTB-21A and GB-21AVR) from -2 to 30 seconds	146

242. Mass flow in broken loop (FDB-23 and GB-23VR) from -2 to 110 seconds	147
243. Mass flow in broken loop (FDB-23 and GB-23VR) from -2 to 30 seconds	147
244. Mass flow in broken loop (FTB-30 and GB-30VR) from -2 to 110 seconds	148
245. Mass flow in broken loop (FTB-30 and GB-30VR) from -2 to 30 seconds	148
246. Mass flow in broken loop (FDB-42 and GB-42VR) from -2 to 110 seconds	149
247. Mass flow in broken loop (FDB-42 and GB-42VR) from -2 to 30 seconds	149
248. Mass flow in vessel (FTV-CORE-IN and GV-COR-150HZ) from -2 to 110 seconds	150
249. Mass flow in vessel (FTV-CORE-IN and GV-COR-150HZ) from -2 to 30 seconds	150
250. Mass flow in vessel (FDV-CORE-IN and GV-COR-150HZ) from -2 to 110 seconds	151
251. Mass flow in vessel (FDV-CORE-IN and GV-COR-150HZ) from -2 to 30 seconds	151
252. Primary pump torque from -2 to 110 seconds	152
253. Primary pump torque from -2 to 30 seconds	152
254. Primary pump power from -2 to 110 seconds	153
255. Primary pump power from -2 to 30 seconds	153
256. Primary pump speed from -2 to 110 seconds	154
257. Primary pump speed from -2 to 30 seconds	154
258. Fluid temperatures in vessel (TFV-LOFT-COR, TFV-ANN-156A, and TFV-LP-7-1/2) from -2 to 230 seconds	155

259. Fluid temperatures in pressure suppression tank from -2 to 230 seconds	155
260. Pressure in intact loop ECC accumulator from -2 to 230 seconds	156
261. Pressure in pressure suppression tank from -2 to 230 seconds.	156
262. Differential pressure in intact loop (DPU-15-ATM) from -2 to 230 seconds	157
263. Differential pressure in intact loop (pressurizer liquid level) from -2 to 230 seconds	157
264. Volumetric flow from intact loop accumulator from -2 to 230 seconds	158
265. Volumetric flow from pressure suppression spray system from -2 to 230 seconds	158
266. Momentum flux in core entrance from -2 to 230 seconds	159
267. Densities in vessel (GV-COR-150HZ and GV-161/192D) from -2 to 230 seconds	159

TABLES

I. Conditions at Blowdown Initiation	7
II. Primary Coolant Temperature Distribution at Rupture	8
III. Water Chemistry Prior to Blowdown	9
IV. Sequence of Events During Test	10
V. Data Presentation for Semiscale Mod-1 Test S-01-1	15

EXPERIMENT DATA REPORT FOR SEMISCALE MOD-1

TEST S-01-1

(Isothermal Blowdown with Core Resistance Simulator)

I. INTRODUCTION

The semiscale Mod-1 experimental program is part of the Semiscale Blowdown and Emergency Core Cooling (ECC) Project conducted by Aerojet Nuclear Company. The semiscale project in turn is part of the United States Energy Research and Development Administration-sponsored research and development program to investigate the response of a water-cooled nuclear reactor system to a hypothesized loss-of-coolant accident (LOCA). The underlying objectives of the semiscale project are to quantify the physical processes controlling system behavior during an LOCA and to provide an experimental data base for assessing reactor safety evaluation models. The semiscale Mod-1 program has the further objective of providing support to other experimental programs in the form of instrumentation assessment, optimization of test series, selection of test parameters, and evaluation of test results.

The semiscale Mod-1 program is conducted with an experimental system designed to simulate the major components of a pressurized water reactor (PWR). Relative to previous experimental systems, the semiscale Mod-1 system advances the representation of a PWR and thus provides a means of acquiring coupled-system response data from which to obtain a more comprehensive understanding of the thermal and hydraulic processes occurring during an LOCA.

Test S-01-1 was conducted in the semiscale Mod-1 system, as part of a series of tests (Test Group 1) to provide data for comparison of the isothermal blowdown response of the semiscale system with that of the Loss-of-Fluid Test (LOFT) system. The semiscale Mod-1 experimental configuration for this test utilized hardware components selected to produce a system performance which simulates LOFT system performance during the LOFT nonnuclear tests. An orificed structure was used in the core barrel of the pressure vessel to simulate the flow resistance of the core simulator to be used in the LOFT nonnuclear tests.

Test S-01-1 was conducted with system subcooling and break area reduced to duplicate the first isothermal test in the LOFT system. The test was initiated by a simulated intermediate size (0.00290 ft^2) double-ended break in the hot leg broken loop piping. The blowdown was accompanied by coolant injection into the inlet annulus above the vessel downcomer to investigate system response relative to ECC delivery to the lower plenum. Additionally, for Test S-01-1, coolant spray was introduced into the pressure suppression tank.

The purpose of this report is to present the test data in an uninterpreted, but readily usable, form for use by the nuclear community in advance of detailed analysis and interpretation. Section II briefly describes the system configuration, procedures, initial test conditions, and events that are applicable to Test S-01-1. Section III presents the data graphs and provides comments and supporting information necessary for interpretation of the data. A description of the overall semiscale program and test series, a detailed description of the semiscale Mod-1 system, and a description of the measurement and data processing techniques and uncertainties can be found in Appendices A, B, and C of Reference 1. Results from previous tests in this series are presented in References 2 through 4.

II. SYSTEM, PROCEDURES, CONDITIONS, AND EVENTS FOR TEST S-01-1

The following system configuration, procedures, initial test conditions, and events are specific to Test S-01-1.

1. SYSTEM CONFIGURATION AND TEST PROCEDURES

The semiscale Mod-1 system used for Test S-01-1 consisted of a pressure vessel with internals; an intact loop with steam generator, pump, and pressurizer; a blowdown loop with simulated steam generator, simulated pump, and two rupture assemblies; a coolant injection system with accumulators and both high- and low-pressure injection pumps; and a pressure suppression system with a suppression tank and header. The semiscale Mod-1 experimental system is described in detail in Appendix B of Reference 1. The system configuration for Test S-01-1 differs from that described in Reference 1 only to the extent that the simulated break was in the hot leg, as shown in Figures 1 and 2 of this report. This configuration has a volume distribution in the broken loop hot leg of 0.321 ft^3 and a volume distribution in the broken loop cold leg of 1.054 ft^3 .

For Test S-01-1, the intact loop steam generator was maintained in the hot standby condition, in which the secondary side was valved off and the primary tubes were completely covered with water (at isothermal system temperature) when blowdown occurred. The system was heated to isothermal conditions with heaters in the bypass lines between the broken and unbroken loops.

In preparation for Test S-01-1, the system was filled with treated demineralized water and vented at strategic points to assure a liquid full system. Prior to warmup, the system was pressurized to check for leakage. Warmup to initial test conditions was accomplished with heaters located in the bypass lines which served to allow circulation through the broken loop. During warmup, the purification and sampling systems were valved into the primary system to maintain water chemistry requirements and to provide a water sample at system conditions for subsequent analysis. These systems were valved out just prior to initiation of blowdown. At 100°F temperature intervals during warmup, detector readings were sampled to allow the integrity of the measurement instrumentation and the operability of the data acquisition system to be checked.

Prior to initiation of the blowdown test, initial test conditions were held for about 20 minutes to establish equilibrium in the system. At the end of this period, all auxiliary systems including the bypass lines were isolated to prevent blowdown through those systems.

Pressure to operate the rupture assemblies and initiate blowdown was taken from the system through lines connected to the reflood bypass simulators. Immediately following initiation of blowdown (0.02 second after initiation of blowdown), these lines were again isolated.

Fig. 1 Semiscale Mod-1 system and instrumentation for hot leg break configuration -- isometric.

Fig. 2 Semiscale Mod-1 system and instrumentation for hot leg break configuration -- schematic.

The speed of the primary coolant circulating pump was held constant for 30 seconds following initiation of blowdown. At 30 seconds, the power to the pump was shut off, and the pump was allowed to coast down for the remainder of the test. A flywheel mounted on the pump motor shaft provided a simulation of the predicted coastdown of the LOFT pumps.

The system was successfully subjected to a simulated double-ended hot leg pipe break through two blowdown nozzles, each having a break area of 0.00145 ft^2 . The effluent was ejected from the primary system into the pressure suppression system.

During the blowdown transient, simulated emergency core coolant (ECC) was injected into the vessel downcomer inlet annulus through use of the high-pressure injection system (HPIS), accumulator, and low-pressure injection system (LPIS).

2. INITIAL TEST CONDITIONS AND SEQUENCE OF EVENTS

Conditions in the semiscale Mod-1 system at initiation of blowdown are given in Tables I and II, the primary system water chemistry prior to blowdown is given in Table III, and the sequence of events relative to rupture is given in Table IV.

TABLE I
CONDITIONS AT BLOWDOWN INITIATION

	<u>Measured</u> ^[a]	<u>Specified</u>
System Fluid Temperature (intact loop, vessel outlet)	540°F	540° <u>±</u> 2°F
System Pressure (vessel upper plenum)	1596 psig	1600+50 psig
Intact Loop Cold Leg Flow	174 gpm	173 <u>±</u> 2 gpm
Intact Loop Accumulator Pressure	599 psig	600 psig ^[b]
Temperature of Injected Coolant	68°F	85°F ^[b]
Intact Loop Accumulator Water Volume	1.36 ft ³	1.63 ft ³ ^[b]
Intact Loop Accumulator Gas Volume	1.33 ft ³	1.11 ft ³ ^[b]
Pressurizer Water Volume	0.79 ft ³	0.69 ft ³ ^[b]
Steam Generator Secondary Steam Dome Pressure	962°F	963 <u>±</u> 40 psig
Steam Generator Secondary Fluid Temperature	549°F	540° <u>±</u> 5°F
Steam Generator Liquid Level (from bottom of tube sheet)	115.4 in.	116 in. ^[b]
Pressure Suppression Tank Water Level	47.0 in.	47.5 in. ^[b]
Pressure Suppression Tank Pressure	16.1 psig	16 psig ^[b]
Pressure Suppression Tank Water Temperature	193°F	193° <u>±</u> 5°F

[a] Measured initial conditions which did not meet the specified initial conditions were considered acceptable for analysis purposes within the test objectives.

[b] Tolerance not specified.

TABLE IIPRIMARY COOLANT TEMPERATURE DISTRIBUTION AT RUPTURE

	<u>Detector</u>	<u>Temperature (°F)</u>
Vessel lower plenum (lower portion)	TFV-LP-1-1/2	534
Vessel lower plenum (upper portion)	TFV-LP-27-1/2	542
Intact loop hot leg (near vessel)	RBU-2	540
Intact loop hot leg (104 in. from vessel center)	TFU-5	541
Intact loop hot leg (near steam generator outlet)	TSU-7	541
Intact loop cold leg	RBU-14	539
Broken loop hot leg (near vessel)	TFB-20	540
Broken loop hot leg (near vessel-side nozzle)	TFB-23	540
Broken loop cold leg (near vessel)	TFB-30	541
Broken loop hot leg (near pump-side nozzle)	TFB-42	537
Reflood bypass, cold leg	TFB-RFBC	538
Reflood bypass, hot leg	TFB-RFBH	540

TABLE III

WATER CHEMISTRY PRIOR TO BLOWDOWN^[a]

pH	10.36
Conductivity (μmhos/cm)	75.2
Suspended Solids (ppm)	10.95
Chlorides (ppm)	1.18
H ₂ (cc/l)	2.6
O ₂ (cc/l)	<0.02
N ₂ (cc/l)	143.1
CO ₂ (cc/l)	0.03
Total Gas (cc/l)	147.0

[a] Water sample taken at a system pressure of 2250 psig and a system temperature of 540°F.

TABLE IV
SEQUENCE OF EVENTS DURING TEST^[a]

<u>Event</u>	<u>Time Relative To Rupture (sec)</u>
Heatup Bypass Lines Valved Out of System	-6
Initiation of Blowdown	0
Initiation of ECC Injection from Intact Loop High-Pressure Injection System Pumps	4
Initiation of ECC Injection from Intact Loop ECC Accumulator	31
Initiation of ECC Injection from Intact Loop ECC Low-Pressure Injection System Pumps	45
Termination of ECC Injection from Intact Loop ECC Accumulator	72
Initiation of Spray to Suppression Tank	104
Termination of ECC Injection from Intact Loop High- and Low-Pressure Injection System Pumps	~230

[a] A time-control sequencer was used to control critical events during the test.

III. DATA PRESENTATION

The data from semiscale Mod-1 Test S-01-1 are presented with brief comment. Processing analysis has been performed only to the extent necessary to obtain appropriate engineering units and to assure that the data are reasonable and consistent. In all cases, in converting transducer output to engineering units, a homogeneous fluid was assumed. Further interpretation and analysis should consider that sudden decompression processes such as those occurring during blowdown may have subjected the measurement devices to nonhomogeneous fluid conditions.

The performance of the system during Test S-01-1 was monitored by about 200 detectors. The data obtained were recorded on both a digital data acquisition system and an analog data acquisition system. The digital system was used to process the data presented in this report. The analog system was used to provide better resolution capability (needed as input to various data analysis codes) and to provide redundancy.

The data are presented, in many instances, in the form of composite graphs to facilitate comparison of a given variable at several locations. Each set of data is presented on two time scales. The first time scale presents data for the entire test, or from -2 to 110 seconds. The second time scale expands the data for the first 30 seconds of the test. The data for each time scale were generated from a separate digital data tape. Since different time intervals exist between sampled data points for different time-base graphs, small differences are present in the transient data. The scales selected do not reflect the obtainable resolution of the data. The data processing techniques are described in greater detail in Appendix C of Reference 1.

Figures 1 through 5 and Table V provide supporting information for interpretation of the data graphs shown in Figures 6 through 257. Figures 1 through 5 show the relative locations of all detectors used during the Mod-1 isothermal series. Table V groups the measurements taken during Test S-01-1 according to measurement type; identifies the specific measurement location and the range of the detector and actual recording range of the data acquisition system; provides brief comments regarding the data; and references the measurements and comments to the corresponding figure. Figures 6 through 257 present all the data obtained. In addition, selected measurements are repeated in Figures 258 through 267 to provide data on the effects of pressure suppression system cooling spray. Time zero on the graphs is the time of rupture initiation.

Fig. 3 Semiscale Mod-1 pressure vessel -- cross section showing instrumentation.

Fig. 4 Semiscale Mod-1 pressure vessel -- isometric showing instrumentation.

Fig. 5 Semiscale Mod-1 pressure vessel -- penetrations and instrumentation.

TABLE V
DATA PRESENTATION FOR SEMISCALE MOD-1 TEST S-01-1

Measurement	Location and Comments [a]	Range [a]		Figure [a]	Measurement Comments [b]
		Detector	Data Acquisition System		
FLUID TEMPERATURE					
Chromel-Alumel thermocouples unless specified otherwise					
<u>Intact Loop</u>					
		0-2300°F	0-591°F	6, 7	
RBU-2	Hot leg, Spool 2, 46 in. from vessel center (platinum resistance bulb)	0-1000°F	0-1000°F		
TFU-5	Hot leg, Spool 5, 104 in. from vessel center				
TSU-7	Cold leg, Spool 7, 246 in. from vessel center (shielded thermocouple)				
TFU-10	Cold leg, Spool 10, 144 in. from vessel center				
RBU-14A	Cold leg, Spool 14, 43 in. from vessel center, upstream of cold leg injection port (platinum resistance bulb)	0-1000°F	0-1000°F		
TFU-14B	Cold leg, Spool 14, 39 in. from vessel center, downstream of cold leg injection port				
TFU-15	Cold leg, Spool 15, 16 in. from vessel center				
<u>Broken Loop</u>					
		0-2300°F	0-591°F	8, 9	
TFB-20	Hot leg, Spool 20, 21 in. from vessel center				
TFB-23	Hot leg, Spool 23, 91 in. from vessel center, upstream of vessel-side nozzle				
TFB-30	Cold leg, Spool 30, 16 in. from vessel center				
TFB-42	Hot leg, Spool 42, 414 in. from vessel center along hot leg, upstream of pump-side nozzle				
TFB-RFBC	Reflood bypass, near end cap, cold-leg side				
TFB-RFBH	Reflood bypass, near end cap, hot-leg side				
<u>Inlet Annulus</u>					
	4 in. below cold leg centerline, 0.2 in. from vessel wall, Type J iron-constantan thermocouples	0-1400°F	0-692°F	10, 11	
TFV-ANN-4A	0°				
TFV-ANN-4M	180°				
<u>Downcomer Annulus</u>					
	Centered in annulus, Type J iron-constantan thermocouples	0-1400°F	0-692°F		
TFV-ANN-15A	15 in. below cold leg centerline, 0°			12, 13	
TFV-ANN-15M	15 in. below cold leg centerline, 180°			12, 13	
TFV-ANN-15T	15 in. below cold leg centerline, 270°			12, 13	
TFV-ANN-35A	35 in. below cold leg centerline, 0°			14, 15	
TFV-ANN-35M	35 in. below cold leg centerline, 180°			14, 15	
TFV-ANN-35T	35 in. below cold leg centerline, 270°			14, 15	
TFV-ANN-70A	70 in. below cold leg centerline, 0°			16, 17	
TFV-ANN-115A	115 in. below cold leg centerline, 0°			16, 17	
TFV-ANN-156A	156 in. below cold leg centerline, 0°			16, 17, 258	
<u>Lower Plenum</u>					
	On fluid thermocouple rack, 1 in. from vessel center, 45°	0-2300°F	0-591°F	18, 19	
TFV-LP-1-1/2	1.5 in. from bottom				
TFV-LP-7-1/2	7.5 in. from bottom			258	
TFV-LP-14-1/2	14.5 in. from bottom				
TFV-LP-21-1/2	21.5 in. from bottom				
TFV-LP-27-1/2	27.5 in. from bottom				

TABLE V (Contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TEST S-01-1

Measurement	Location and Comments [a]	Range [a]		Figure [a]	Measurement Comments [b]
		Detector	Data Acquisition System		
<u>Core</u>		0-2300°F	0-591°F		
TFV-LOFT-COR	Near LOFT core turbine flowmeter, 14 in. below cold leg centerline			20, 21, 258	Increase in temperature from t=2 sec to t=6 questionable
<u>Core Barrel Insulation Gap</u>	Type J iron-constantan thermocouples	0-1400°F	0-692°F	22, 23	
TFV-CIG-70A	70 in. below cold leg centerline, 0°				
TFV-CIG-115A	115 in. below cold leg centerline, 0°				
<u>Vessel Filler - Insulation Gap</u>		0-1400°F	0-692°F	24, 25	
TFV-FIG-70A	70 in. below cold leg centerline, 0°				
TFV-FIG-156A	156 in. below cold leg centerline, 0°				
<u>Steam Generator</u>		0-2300°F	0-591°F	26, 27	
TFU-SG1	Secondary side, 12 in. above bottom of tube sheet				
TFU-SG2	Secondary side, 24 in. above bottom of tube sheet				
TFU-SG3	Secondary side, 48 in. above bottom of tube sheet				
TFU-SG4	Secondary side, 96 in. above bottom of tube sheet				
<u>Pressurizer</u>		0-2300°F	0-591°F	28, 29	
TFU-PRIZE	In surge line, near pressurizer exit, between turbine flowmeter and pressurizer				
<u>Pressure Suppression System</u>		0-2300°F	0-591°F	30, 31, 259	
TF-PSS-17	17 in. from bottom of tank				
TF-PSS-33	33 in. from bottom of tank				
TF-PSS-130	130 in. from bottom of tank				
MATERIAL TEMPERATURE	Chromel-Alumel thermocouples unless specified otherwise	0-2300°F	0-591°F		
<u>Intact Loop</u>					
TMU-1T16	Hot leg, Spool 1, top, 1/16 in. from pipe ID, 29 in. from vessel center				Data not recorded; data acquisition system malfunctioned
TMU-1S16	Hot leg, Spool 1, side, 1/16 in. from pipe ID, 29 in. from vessel center			32, 33	
TMU-1B16	Hot leg, Spool 1, bottom, 1/16 in. from pipe ID, 29 in. from vessel center			32, 33	
TMU-5B16	Hot leg, Spool 5, bottom, 1/16 in. from pipe ID, 102 in. from vessel center			32, 33	
TMU-7S16	Cold leg, Spool 7, side, 1/16 in. from pipe ID, 242 in. from vessel center (vertical pipe)			32, 33	
TMU-8S16	Cold leg, Spool 8, side, in pump trap, 1/16 in. from pipe ID, 195 in. from vessel center			34, 35	
TMU-10S16	Cold leg, Spool 10, side, 1/16 in. from pipe ID, 144 in. from vessel center			34, 35	
TMU-15T16	Cold leg, Spool 15, top, 1/16 in. from pipe ID, 17 in. from vessel center			34, 35	
TMU-15B16	Cold leg, Spool 15, bottom, 1/16 in. from pipe ID, 17 in. from vessel center			34, 35	
<u>Broken Loop</u>		0-2300°F	0-591°F	36, 37	
TMB-20B16	Hot leg, Spool 20, bottom, 1/16 in. from pipe ID, 21 in. from vessel center				
TMB-20S16	Hot leg, Spool 20, side, 1/16 in. from pipe ID, 21 in. from vessel center				
TMB-20T16	Hot leg, Spool 20, top, 1/16 in. from pipe ID, 21 in. from vessel center				

TABLE V (Contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TEST S-01-1

Measurement	Location and Comments [a]	Range [a]		Figure [a]	Measurement Comments
		Detector	Data Acquisition System		
<u>Broken Loop (Contd.)</u>					
TMB-30B16	Cold leg, Spool 30, bottom, 1/16 in. from pipe ID, 16 in. from vessel center				
TMB-40S16	Cold leg, Spool 40, discharge of simulated pump, vertical section, side, 1/16 in. from pipe ID, 60 in. from vessel center				
<u>Vessel Wall</u>	1/8 in. from vessel ID	0-2300°F	0-591°F	38, 39	
TMV-VI-35A	35 in. below cold leg centerline, 0°				
TMV-VI-177M	177 in. below cold leg centerline, 180°				
<u>Vessel Filler</u>	Type J iron-constantan thermocouples	0-1400°F	0-692°F		
TMV-FO-15A	35 in. below cold leg centerline, 0.65 in. from filler ID, 0°			40, 41	
TMV-FO-156A	156 in. below cold leg centerline, 0.65 in. from filler ID, 0°			40, 41	
TMV-FO-177M	177 in. below cold leg centerline, 0.65 in. from filler ID, 180°			40, 41	
TMV-FI-4M	4 in. below cold leg centerline, 1/16 in. from filler ID, 180°			42, 43	Thickness of filler at this location exposes thermocouple to fluid
TMV-FI-15A	15 in. below cold leg centerline, 1/16 in. from filler ID, 0°			42, 43	
TMV-FI-35A	35 in. below cold leg centerline, 1/16 in. from filler ID, 0°			42, 43	
TMV-FI-35M	35 in. below cold leg centerline, 1/16 in. from filler ID, 180°			42, 43	
TMV-FI-70A	70 in. below cold leg centerline, 1/16 in. from filler ID, 0°			44, 45	
TMV-FI-115A	115 in. below cold leg centerline, 1/16 in. from filler ID, 0°			44, 45	
TMV-FI-156A	156 in. below cold leg centerline, 1/16 in. from filler ID, 0°			44, 45	
TMV-FI-156M	156 in. below cold leg centerline, 1/16 in. from filler ID, 180°			44, 45	
TMV-FI-177M	177 in. below cold leg centerline, 1/16 in. from filler ID, 180°			44, 45	
<u>Vessel Filler Insulator</u>	Outer surface of insulator, Type J iron-constantan thermocouples	0-1400°F	0-692°F	46, 47	
TIV-FO-4A	4 in. below cold leg centerline, 0°				
TIV-FO-35A	35 in. below cold leg centerline, 0°				
TIV-FO-35M	35 in. below cold leg centerline, 180°				
TIV-FO-70A	70 in. below cold leg centerline, 0°				
TIV-FO-115A	115 in. below cold leg centerline, 0°				
TIV-FO-156A	156 in. below cold leg centerline, 0°				
<u>Lower Plenum</u>	Chromel-Alumel thermocouple	0-2300°F	0-591°F	48, 49	
TMV-LH	In vessel bottom head, 1/8 in. from inside surface, 2 in. from vessel centerline, 90°				
<u>Core Barrel</u>	Type J iron-constantan thermocouples	0-1400°F	0-692°F		
TMV-CO-4A	4 in. below cold leg centerline, in inlet annulus region, 1/16 in. from core barrel OD, 0°			50, 51	
TMV-CO-4M	4 in. below cold leg centerline, in inlet annulus region, 1/16 in. from core barrel OD, 180°				Data not recorded; data acquisition system malfunctioned
TMV-CO-15A	15 in. below cold leg centerline, 1/16 in. from core barrel OD, 0°			50, 51	
TMV-CO-70A	70 in. below cold leg centerline, 1/16 in. from core barrel OD, 0°			50, 51	
TMV-CO-115A	115 in. below cold leg centerline, 1/16 in. from core barrel OD, 0°			50, 51	

TABLE V (Contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TEST S-01-1

Measurement	Location and Comments [a]	Range [a]		Figure [a]	Measurement Comments [b]
		Detector	Data Acquisition System		
<u>Core Barrel (Contd.)</u>					
TMV-CO-115M	115 in. below cold leg centerline, 1/16 in. from core barrel OD, 180°			50, 51	
TMV-CI-70A	70 in. below cold leg centerline, 1/16 in. from core barrel ID, 0°			52, 53	
TMV-CI-115A	115 in. below cold leg centerline, 1/16 in. from core barrel ID, 0°			52, 53	
<u>Steam Generator</u>		0-2300°F	0-591°F	54, 55	
TMU-SG1	On steam generator tubes, 12 in. above bottom of tube sheet, on OD of tube				
TMU-SG2	On steam generator tubes, 24 in. above bottom of tube sheet, on OD of tube				
TMU-SG3	On steam generator tubes, 48 in. above bottom of tube sheet, on OD of tube				
TMU-SG4	On steam generator tubes, 96 in. above bottom of tube sheet, on OD of tube				
PRESSURE					
<u>Intact Loop</u>		0-3000 psig	0-4000 psig		Data not digitized due to limited channel availability; data available on analog system
PU-13(F)	Cold leg, Spool 13, 54 in. from vessel center (flush mount)				
<u>Broken Loop</u>		0-3000 psig	0-4000 psig		
PB-23	Hot leg, Spool 23, 92 in. from vessel center, upstream of vessel-side nozzle (tee off DP tap)			56, 57	
PB-CN1	Vessel-side nozzle, nozzle throat, 96 in. from vessel center, (tee off DP tap)			56, 57	
PB-42	Hot leg, Spool 42, 414 in. from vessel center along cold leg, upstream of pump-side nozzle (tee off DP tap)			58, 59	
PB-HN1	Pump-side nozzle, nozzle throat, 418 in. from vessel center along cold leg (tee off DP tap)			58, 59	Data have a -50 psid offset prior to t=0 sec.
<u>Vessel</u>		0-3000 psig	0-4000 psig	60, 61	
PV-UP+10	In upper plenum, 10 in. above cold leg centerline, mounted on standoff, 30°				
PV-LP-180	In upper part of lower plenum, 180 in. below cold leg centerline, mounted on standoff, 225°				
PV-IANN-9	In vessel inlet annulus, 9 in. below cold leg centerline, mounted on standoff, 225°				
<u>ECC System</u>		0-750 psig	0-750 psig	62, 260	
PECC-UL-ACC	In intact loop accumulator				
<u>Pressurizer</u>		0-3000 psig	0-4000 psig	63, 64	
PU-PRIZE	Steam dome				
<u>Pressure Suppression System</u>		0-100 psig	0-100 psig	65, 66, 261	
P-PSS	Suppression tank top				
DIFFERENTIAL PRESSURE					
<u>Intact Loop</u>					
DFU-UP-1	Upper plenum 10.5 in. above cold leg centerline at 30° to hot leg, Spool 1, 31 in. from vessel center, upper plenum tap approximately 2 in. above Spool 1 tap	+50 in. water	+2.5 psid	67, 68	Data suspect due to questionable calibration

TABLE V (Contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TEST S-01-1

Measurement	Location and Comments [a]	Range [a]		Figure [a]	Measurement Comments [b]
		Detector	Data Acquisition System		
Intact Loop (Contd.)					
DPU-UP-3	Upper plenum 10.5 in. above cold leg centerline at 30° to hot leg, Spool 3, 62 in. from vessel center, upper plenum tap approximately 2 in. above Spool 3 tap	±300 in. water	±15 psid	69, 70	
DPU-3-7	Across steam generator, hot leg, Spool 3, 62 in. from vessel center to cold leg Spool 7, 231 in. from vessel center, Spool 3 tap approximately 18 in. above Spool 7 tap	±500 in. water	±25 psid	71, 72	
DPU-3-7L	Across steam generator, hot leg, Spool 3, 62 in. from vessel center to cold leg Spool 7, 231 in. from vessel center, Spool 3 tap approximately 18 in. above Spool 7 tap (low range)	±50 in. water	±2.5 psid	73, 74	
DPU-3-SGIP	Across inlet orifice of steam generator; hot leg, Spool 3, 62 in. from vessel center to steam generator inlet plenum, 145 in. from vessel center, Spool 3 tap is 16 in. below SGIP tap	±500 in. water	±25 psid	75, 76	
DPU-6-SGIP	Hot leg, Spool 6, 114 in. from vessel center to steam generator inlet plenum, 145 in. from vessel center, Spool 6 tap is 16 in. below SGIP tap	±800 in. water	±40 psid	77, 78	
DPU-SG1-SG2	Across primary side tubes, 12 to 24 in. above bottom of tube sheet, SG1 tap is 12 in. below SG2 tap	±20 in. water	±1.0 psid	79, 80	Data questionable; detector sense lines have potential for draining; detector should measure -0.43 psid for empty system with no flow
DPU-SGOP-7	From steam generator outlet plenum, 269 in. from vessel center along cold leg to cold leg Spool 7, 231 in. from vessel center, including orifice, Spool 7 tap is 35 in. below SGOP tap	±500 in. water	±25 psid	81, 82	
DPU-7-10	Steam generator outlet to pump inlet, cold leg Spool 7, 231 in. from vessel center to cold leg Spool 10, 141 in. from vessel center	±50 in. water	±2.5 psid	83, 84	
DPU-8C-8D	In pump trap, cold leg Spool 8, Tap 8C, 197 in. from vessel center to Tap 8D, 184 in. from vessel center, Tap 8C is 10 in. below Tap 8D	±20 in. water	±1.0 psid	85, 86	Data questionable; polarity appears reversed. Detector also has questionable calibration
DPU-8D-8E	In pump trap, cold leg Spool 8, Tap 8D, 184 in. from vessel center to Tap 8E, 174 in. from vessel center, Tap 8D is 10 in. below Tap 8E	±20 in. water	±1.0 psid	87, 88	Data suspect due to questionable calibration
DPU-12-10	Pump outlet to pump inlet, cold leg Spool 12, 75 in. from vessel center to cold leg Spool 10, 141 in. from vessel center, Spool 10 tap is 10 in. below Spool 12 tap	±50 psid	±50 psid	89, 90	
DPU-12-10L	Pump outlet to pump inlet, cold leg Spool 12, 75 in. from vessel center to cold leg Spool 10, 141 in. from vessel center, Spool 10 tap is 10 in. below Spool 12 tap (low range)	±100 in. water	±5.0 psid	91, 92	
DPU-12-15	Across cold leg injection point, cold leg Spool 12, 75 in. from vessel center to cold leg Spool 15, 16 in. from vessel center	±100 in. water	±5.0 psid	93, 94	
DPU-15-1	Cold leg to hot leg, cold leg Spool 15, 16 in. from vessel center to hot leg Spool 1, 31 in. from vessel center, Spool 15 tap is 8.5 in. below Spool 1 tap	±500 in. water	±25 psid	95, 96	
DPU-15-1L	Cold leg to hot leg, cold leg Spool 15, 16 in. from vessel center to hot leg Spool 1, 31 in. from vessel center, Spool 15 tap is 8.5 in. below Spool 1 tap (low range)	±50 in. water	±2.5 psid	97, 98	Data acquisition system saturated until t=4.5 sec
DPU-15-1ANN	Cold leg Spool 15, 16 in. from vessel center to inlet annulus 9 in. below cold leg centerline at 225°, Spool 15 tap is 9 in. above inlet annulus tap	±100 in. water	±5.0 psid	99, 100	
DPU-15-ATM	Cold leg Spool 15, 16 in. from vessel center to atmosphere	±500 psid	±500 psid	101, 262	Data acquisition system saturated until t=33 sec
DPU-PRESLL	Pressurizer water level, elevation difference between taps is 34 in., lower tap is approximately 3.5 in. above pressurizer exit	±50 in. water	±2.5 psid	102, 103, 263	Liquid level results in a liquid volume prior to rupture of 0.79 ft ³

TABLE V (Contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TEST S-01-1

Measurement	Location and Comments ^[a]	Range ^[a]		Figure ^[a]	Measurement Comments ^[b]
		Detector	Data Acquisition System		
Broken Loop					
DPB-UP-21A	Upper plenum 10.5 in. above cold leg centerline at 30° to hot leg Spool 21A, 48 in. from vessel center, Upper plenum tap approximately 2 in. above Spool 21A tap	+100 in. water	+5.0 psid	104, 105	
DPB-21A-23	Hot leg Spool 21A, 48 in. from vessel center to hot leg Spool 23, 92 in. from vessel center	+800 in. water	+40 psid	106, 107	
DPB-23-GNI	Hot leg Spool 23, 92 in. from vessel center to vessel-side nozzle throat, 96 in. from vessel center	+500 psid	+500 psid	108, 109	Data appear to have a 10 psid drift by 110 sec; detector should measure 0 psid for an empty system with no flow
DPB-CN1-CNA	Vessel-side nozzle, nozzle throat, 96 in. from vessel center to nozzle divergent section, 101 in. from vessel center	+1000 psid	+1300 psid	110, 111	
DPB-23-24	Across vessel-side nozzle, Spool 23, 92 in. from vessel center to Spool 24, 103 in. from vessel center	+1000 psid	+1300 psid	112, 113	
DPB-1A111-30	Vessel inlet annulus 9 in. below cold leg centerline at 225° to cold leg Spool 30, 18 in. from vessel center, inlet annulus tap is approximately 8 in. below Spool 30 tap	+100 in. water	+5.0 psid	114, 115	
DPB-30-40	Cold leg Spool 30, 18 in. from vessel center to cold leg Spool 40, 63 in. from vessel center, Spool 30 is 31 in. above Spool 40 tap	+100 psid	+100 psid	116, 117	
DPB-40-38	Across simulated pump, cold leg Spool 50, 63 in. from vessel center to cold leg Spool 38, 123 in. from vessel center along cold leg	+500 psid	+500 psid	118, 119	
DPB-40-38L	Across simulated pump, cold leg Spool 40, 63 in. from vessel center to cold leg Spool 38, 123 in. from vessel center (low range)	+500 in. water	+25 psid	120	Data acquisition system saturated until t=42 sec
DPB-38-36U	Cold leg Spool 38, 123 in. from vessel center to cold leg Spool 36, upper tap 196 in. from vessel center, Spool 38 tap is 70 in. lower than Spool 36 upper tap	+500 in. water	+25 psid	121, 122	Data have an apparent 0.4 psid drift by 110 sec; detector should measure -2.5 psid for empty system with no flow
DPB-37-36U	Cold leg Spool 37, 146 in. from vessel center to cold leg Spool 36 upper tap 196 in. from vessel center, Spool 37 tap is 47 in. below Spool 36 upper tap	+50 psid	+50 psid	123, 124	Data appear to have a -0.8 psid drift by 110 sec; detector should measure -1.7 psid for empty system with no flow
DPB-37-42	Across simulated steam generator assembly, cold leg Spool 37, 146 in. from vessel center to hot leg Spool 42, 414 in. from vessel center along cold leg, Spool 37 tap is approximately 7 in. below Spool 42 tap	+100 psid	+100 psid	125, 126	Data have an apparent 4.0 psid drift by 110 sec; detector should measure -0.25 psid for empty system with no flow
DPB-36U-32L	Across simulated steam generator assembly, cold leg Spool 36 upper tap 196 in. from vessel center to hot leg Spool 32 lower tap 365 in. from vessel center along cold leg, Spool 36 upper tap is 10 in. above Spool 32 lower tap	+50 psid	+50 psid	127, 128	
DPB-42-43	Across pump-side nozzle, hot leg Spool 42, 414 in. from vessel center along cold leg to hot leg Spool 43, 426 in. from vessel center along cold leg	+1000 psid	+1300 psid	129, 130	
DPB-42-HH1	Spool 42 upstream of pump-side nozzle, 414 in. from vessel center along cold leg to nozzle throat, 418 in. from vessel center along cold leg	+500 psid	+500 psid	131, 132	Corrected data have an apparent 9 psid drift by 100 sec; detector should measure 0 psid for empty system with no flow
DPB-HN1-HN4	Pump-side nozzle, nozzle throat, 418 in. from vessel center along cold leg to nozzle divergent section, 423 in. from vessel center along cold leg	+1000 psid	+1300 psid	133, 134	
DPB-HN4-43	Pump-side nozzle, divergent section, 423 in. from vessel center along cold leg to downstream Spool 43, 426 in. from vessel center along cold leg	+50 psid	+50 psid	135, 136	

TABLE V (Contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TEST S-01-1

Measurement	Location and Comments ^[a]	Range ^[a]		Figure ^[a]	Measurement Comments ^[b]
		Detector	Data Acquisition System		
Vessel					
DPU-15-IANN	Intact loop cold leg Spool 15, 16 in. from vessel center to inlet annulus 9 in. below cold leg centerline at 225°, Spool 15 tap is 9 in. above inlet annulus tap	+100 in. water	+5.0 psid	99, 100	
DPB-UP-21A	Upper plenum 10.5 in. above cold leg centerline at 30° to hot leg Spool 21A, 48 in. from vessel center, upper plenum tap is approximately 2 in. above Spool 21A tap	+100 in. water	+5.0 psid	104, 105	
DPV-UP-IANN	Upper plenum, 10.5 in. above cold leg centerline at 30° to Inlet annulus, 9 in. below cold leg centerline at 225°, elevation difference between taps is 19 in.	+300 in. water	+15 psid	137, 138	
DPV-O-9GQ	Inlet annulus cold leg centerline at 90° to 9 in. below cold leg centerline at 225°, elevation difference between taps is 9 in.	+20 in. water	+1.0 psid		Data not valid; leaking manifold common to differential pressure cells at 9 in. below cold leg centerline
DPV-9-26Q	Inlet annulus, 9 in. below cold leg centerline at 225° to downcomer gap approximately 26 in. below cold leg centerline at 225°, elevation difference between taps is 17 in.	+50 in. water	+2.5 psid	139, 140	Data questionable; leaking manifold common to differential pressure cells at 9 in. below cold leg centerline
DPV-9-180Q	Inlet annulus, 9 in. below cold leg centerline at 225° to lower plenum, 180 in. below cold leg centerline at 225°, elevation difference between taps is 171 in.	+300 in. water	+15 psid	141, 142	Data questionable; leaking manifold common to differential pressure cells at 9 in. and 180 in. below cold leg centerline
DPV-26-55QM	Across part of downcomer, 26 in. (225°) to 55 in. (180°) below centerline of cold leg, elevation difference between taps is 29 in.	+50 in. water	+2.5 psid	143, 144	
DPV-55-110AM	Across part of downcomer, 55 in. (0°) to 110 in. (180°) below cold leg centerline, elevation difference between taps is 55 in.	+100 in. water	+5.0 psid	145, 146	
DPV-110-156MQ	Across part of downcomer, 110 in. (180°) to 156 in. (225°) below cold leg centerline, elevation difference between taps is 46 in.	+100 in. water	+5.0 psid	147, 148	
DPV-156-173QQ	Across downcomer exit, 7 in. above exit to 10 in. below exit, taps at 156 in. (225°) and 173 in. (225°) below cold leg centerline, elevation difference between taps is 17 in.	+20 in. water	+1.0 psid	149, 150	Data suspect due to questionable calibration
DPV-166-173QQ	Across part of lower plenum, 166 in. (225°) to 173 in. (225°) below cold leg centerline, elevation difference between taps is 7 in.	+20 in. water	+1.0 psid	151, 152	Data suspect due to questionable calibration
DPV-173-180QQ	Across part of lower plenum, 173 in. (225°) to 180 in. (225°) below cold leg centerline, elevation difference between taps is 7 in.	+20 in. water	+1.0 psid		Data not valid; leaking manifold common to differential pressure cells at 180 in. below cold leg centerline
DPV-180-191QT	Across part of lower plenum, 180 in. (225°) to 191 in. (270°) below cold leg centerline, elevation difference between taps is 11 in.	+20 in. water	+1.0 psid		Data not valid; leaking manifold common to differential pressure cells at 180 in. below cold leg centerline
DPV-166-191QT	Across lower plenum, 166 in. (225°) to 191 in. (270°) below cold leg centerline, elevation difference between taps is 25 in.	+50 in. water	+2.5 psid	153, 154	
DPV-LP-UP	Lower plenum, 180 in. below cold leg centerline at 225° to upper plenum 10.5 in. above cold leg centerline at 30°, elevation difference between taps is 191 in.	+300 in. water	+15 psid		Data not recorded; data acquisition system malfunctioned
DPU-UP-1	Upper plenum, 10.5 in. above cold leg centerline at 30° to intact loop hot leg Spool 1, 31 in. from vessel center, upper plenum tap is approximately 2 in. above Spool 1 tap	+50 in. water	+2.5 psid	67, 68	Data suspect due to questionable calibration
DPU-UP-3	Vessel upper plenum, 10.5 in. above cold leg centerline at 30° to intact loop hot leg Spool 3, 62 in. from vessel center, upper plenum tap is approximately 2 in. above Spool 3 tap	+300 in. water	+15 psid	69, 70	
DPB-IANN-30	Vessel inlet annulus 9 in. below cold leg centerline at 225° to cold leg Spool 30, 18 in. from vessel center, inlet annulus tap is approximately 8 in. below Spool 30 tap	+100 in. water	+5.0 psid	114, 115	

TABLE V (Contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TEST S-01-1

Measurement	Location and Comments [a]	Range [a]		Figure [a]	Measurement Comments [b]
		Detector	Data Acquisition System		
<u>Steam Generator</u>					
DPU-3-SGIP	Across inlet orifice, hot leg Spool 3, 62 in. from vessel center to steam generator inlet plenum, 145 in. from vessel center, Spool 3 tap is 16 in. below SGIP tap	+500 in. water	+25 psid	75, 76	
DPU-6-SGIP	Hot leg Spool 6, 114 in. from vessel center to steam generator inlet plenum, 145 in. from vessel center, Spool 6 tap is 16 in. below SGIP tap	+800 in. water	+40 psid	77, 78	
DPU-SG1-SG2	Across primary side tubes, 12 to 24 in. above bottom of tube sheet, SG1 tap is 12 in. below SG2 tap	+20 in. water	+1.0 psid	79, 80	Data questionable; detector sense lines have potential for draining; detector should measure -0.43 psid for empty system with no flow
DPU-SGCP-7	From steam generator outlet plenum, 269 in. from vessel center along cold leg to cold leg Spool 7, 231 in. from vessel center, including orifice, Spool 7 tap is 35 in. below SGCP tap	+500 in. water	+25 psid	81, 82	
DPU-SG-SEC	Secondary side, differential pressure taps at 45 and 126 in. above bottom of tube sheet, elevation difference between taps is 81 in.	+100 in. water	+5.0 psid	155, 156	Liquid level calculated from this measurement is 121 in. above bottom of tube sheet prior to rupture
<u>Pressurizer</u>					
DPU-PRESLL	Pressurizer water level, elevation difference between taps is 34 in., lower tap is approximately 3.5 in. above pressurizer exit	+50 in. water	+2.5 psid	102, 103, 263	Liquid level results in a liquid volume prior to rupture of 0.79 ft ³
<u>VOLUMETRIC FLOW RATE</u>					
<u>Intact Loop</u>					
Turbine flowmeter, bidirectional					
3-in. Schedule 160 pipe					
FTU-1	Hot leg, Spool 1, 18 in. from vessel center	+20-400 gpm	+655 gpm	157, 158	Detector range exceeded after t=107 sec
FTU-9	Cold leg, Spool 9, 154 in. from vessel center	+20-400 gpm	+649 gpm	157, 158	Detector range exceeded from t=63 sec to t=73 sec
FTU-13	Cold leg, Spool 13, 64 in. from vessel center	+20-400 gpm	+640 gpm	159, 160	Detector range exceeded at various times during test. Data questionable from t=13 sec to t=50 sec
FTU-15	Cold leg, Spool 15, 29 in. from vessel center	+10-200 gpm	+389 gpm	159, 160	Detector range exceeded at various times during test. Data acquisition system saturated from t=59 sec to t=73 sec
<u>Broken Loop</u>					
All measurements bidirectional, Schedule 160 pipe					
FTB-21A	Hot leg, Spool 21A, 57 in. from vessel center, 3-in. pipe	+20-400 gpm	+847 gpm		Detector range exceeded at various times during test. Data acquisition system saturated from t=46 sec to t=63 sec
FTB-30	Cold leg, Spool 30, 24 in. from vessel center, 3-in. pipe	+20-400 gpm	+408 gpm		Erratic data prior to rupture caused by electronic interference with detector during heatup bypass valve closure
FTB-37	Cold leg, Spool 37, 138 in. from vessel center, 2-in. pipe	+10-200 gpm	+657 gpm		Erratic data prior to rupture caused by electronic interference with detector during heatup bypass valve closure. Detector range exceeded from t=28 sec to t=32 sec
<u>Core</u>					
FTV-CORE-IN	Entrance to core, approximately 158 in. below cold leg centerline	+20-400 gpm	+405 gpm	163, 164	
FTV-LOFT-COR	In LOFT core simulator, 14 in. below cold leg centerline (LOFT drag-disc, turbine flowmeter combination)				Experimental detector; data not processed for this report
<u>ECC System</u>					
FTU-HPIS	In line immediately after HPIS pump for intact loop, 1/2-in. line	0.1-1.0 gpm	1.0 gpm	165, 166	
FTU-LPIS	In line leading from LPIS for intact loop, 1/2-in. line	0.5-10 gpm	10 gpm	167	
FTU-ACC	In line immediately after intact loop accumulator, 1-in. line	4-75 gpm	75 gpm	168, 264	Data acquisition system saturated from t=78 sec to t=83 sec
<u>Pressurizer</u>					
FTU-PRIZE	Surge line	5-100 gpm	111 gpm	169, 170	
<u>PRESSURE SUPPRESSION SYSTEM</u>					
FTPSS-SPRAY	1-1/2-in. line from accumulator for suppression tank spray	+0.5-10 gpm	10 gpm	171, 265	Data have a 0.3 gpm offset prior to t=105 sec

TABLE V (Contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TEST S-01-1

Measurement	Location and Comments ^[a]	Range ^[a]		Figure ^[a]	Measurement Comments ^[b]
		Detector	Data Acquisition System		
FLUID VELOCITY					
Turbine flowmeter, bidirectional					
Downcomer Cap					
FTV-22M	22 in. below cold leg centerline, 180°	+2.5-50 ft/sec	+50.4 ft/sec	172, 173	Small measured velocity prior to rupture questionable
FTV-40A	40 in. below cold leg centerline, 0°	+2.5-50 ft/sec	+50.4 ft/sec	174, 175	
FTV-40M	40 in. below cold leg centerline, 180°	+2.5-50 ft/sec	+50.4 ft/sec	176, 177	
FTV-83A	83 in. below cold leg centerline, 0°	+1.8-36 ft/sec	+36 ft/sec	178, 179	Unidirectional; detector measured magnitude only
FTV-83M	83 in. below cold leg centerline, 180°	+1.8-36 ft/sec	+36 ft/sec	180, 181	
FTV-130M	130 in. below cold leg centerline, 180°	+0.9-18 ft/sec	+18 ft/sec		Detector failed
FTV-161M	161 in. below cold leg centerline, 180°	+0.9-18 ft/sec	+18 ft/sec		Detector failed
MOMENTUM FLUX					
Drag-disc bidirectional. Computer conversion of voltage output to momentum flux in unidirectional and therefore shows magnitude only					
Intact Loop					
3-in. pipe					
FDU-1	Hot leg, Spool 1, 29 in. from vessel center, target size 0.875	+250-11,500 lb _m /ft-sec ²	+15,000 lb _m /ft-sec ²	182, 183	
FDU-5	Hot leg, Spool 5, 100 in. from vessel center, target size 1.0	+1-2000 lb _m /ft-sec ²	+2000 lb _m /ft-sec ²	184, 185	Data not valid prior to t=0 sec. Data acquisition system saturated from t=0 sec to t=3 sec.
FDU-10	Cold leg, Spool 10, 137 in. from vessel center, target size 0.875	+200-204,000 lb _m /ft-sec ²	+130,000 lb _m /ft-sec ²	186, 187	
FDU-13	Cold leg, Spool 13, 54 in. from vessel center, target size 0.875	+200-11,000 lb _m /ft-sec ²	+14,800 lb _m /ft-sec ²	188, 189	
FDU-15	Cold leg, Spool 15, 19 in. from vessel center, target size 0.875	+200-11,600 lb _m /ft-sec ²	+15,500 lb _m /ft-sec ²	190, 191	
Broken Loop					
FDB-21A	Hot leg, Spool 21A, 52 in. from vessel center, 3-in. pipe, target size 0.406	+200-70,500 lb _m /ft-sec ²	+94,000 lb _m /ft-sec ²	192, 193	
FDB-23	Hot leg, Spool 23, 93 in. from vessel center, upstream of vessel-side nozzle, downstream of injection point, 1.5-in. pipe, target size 0.406	+200-125,000 lb _m /ft-sec ²	+167,000 lb _m /ft-sec ²	194, 195	
FDB-30	Cold leg, Spool 30, 20 in. from vessel center, 3-in. pipe, target size 0.656	+200-60,000 lb _m /ft-sec ²	+80,000 lb _m /ft-sec ²		Detector range causes insensitivity to flow at this location
FDB-37	Cold leg, Spool 37, 143 in. from vessel center, steam generator outlet vertical pipe, 2-in. pipe, target size 0.406	+200-131,000 lb _m /ft-sec ²	+175,000 lb _m /ft-sec ²	196, 197	
FDB-42	Hot leg, Spool 42, 416 in. from vessel center along hot leg, upstream of pump-side nozzle, downstream of injection point, 1.5-in. pipe, target size 0.406	+200-116,000 lb _m /ft-sec ²	+155,000 lb _m /ft-sec ²	198, 199	
Vessel					
FDV-CORE-IN	In core flow mixer box, 150 in. below cold leg centerline, target size 1.0	+100-1000 lb _m /ft-sec ²	+1000 lb _m /ft-sec ²	200, 201, 266	
FDV-LOFT-COR	In LOFT core simulator, 14 in. below cold leg centerline (LOFT drag-disc, turbine flowmeter combination) target size 0.500 in.				Experimental detector; data not processed for this report
DENSITY					
Intact Loop		0.1-100 lb _m /ft ³	0.1-100 lb _m /ft ³		
GU-1VR	Hot leg, Spool 1, 24 in. from vessel center, vertical			202, 203	
GU-1HZ	Hot leg, Spool 1, 26 in. from vessel center, horizontal			202, 203	
GU-5VR	Hot leg, Spool 5, 96 in. from vessel center, vertical			204, 205	

TABLE V (Contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TEST S-01-1

Measurement	Location and Comments [a]	Detector	Range [a] Data Acquisition System	Figure [a]	Measurement Comments [b]
<u>Intact Loop (Contd.)</u>					
GU-10VR	Cold leg, Spool 10, 141 in. from vessel center, vertical			204, 205	
GU-13VR	Cold leg, Spool 13, 59 in. from vessel center, vertical			206, 207	
GU-15HZ	Cold leg, Spool 15, 20 in. from vessel center, horizontal			208, 209	
GU-15VR	Cold leg, Spool 15, 23 in. from vessel center, vertical			208, 209	
<u>Broken Loop</u>		0.1-100 lb _m /ft-sec ²	0-100 lb _m /ft-sec ²		
GB-21AVR	Hot leg, Spool 21A, 48 in. from vessel center, vertical			210, 211	Increase in measured density immediately after rupture invalid
GB-23VR	Hot leg, Spool 23, 92 in. from vessel center, vertical			210, 211	
GB-30VR	Cold leg, Spool 30, 18 in. from vessel center, vertical			212, 213	
GB-42VR	Hot leg, Spool 42, 414 in. from vessel center along hot leg, vertical			212, 213	
<u>Vessel</u>		0.1-100 lb _m /ft-sec ²	0-100 lb _m /ft-sec ²		
GV-COR-150HZ	Core flow mixer box, 152 in. below cold leg centerline, horizontal, 0-180°			214, 215, 267	
GV-161/192D	Lower plenum 161 in. below cold leg centerline (270°) to 192 in. below cold leg centerline (90°), 31 in. vertical 32.2 in. diagonal			214, 215, 267	Due to instrument resolution limitation data are inaccurate outside selected limits of 15 lb _m /ft ³ and 45 lb _m /ft ³
GVLP-172HZ	Lower plenum, 172 in. below cold leg centerline, 8.729 in. below downcomer exit, horizontal, 90-270°			216, 217	
<u>Pressurizer</u>		0.1-100 lb _m /ft-sec ²	0-100 lb _m /ft-sec ²		
GU-PRIZE	Surge line			218, 219	
<u>LIQUID LEVEL</u>					
<u>Steam Generator</u>					
DPU-SG-SEC	Secondary side, differential pressure taps at 45 and 126 in. above tube sheet, elevation difference between taps is 81 in.	±100 in. water	±5.0 psid	155, 156	Liquid level calculated from this measurement is 121 in. above bottom of tube sheet prior to rupture
<u>Pressurizer</u>					
DPU-PRESLL	Pressurizer water level, elevation difference between taps is 34 in., lower tap is approximately 3.5 in. above pressurizer exit	±50 in. water	±2.5 psid	102, 103, 263	Liquid level results in liquid volume prior to rupture of 0.79 ft ³
<u>MASS FLOW RATE</u>		0.1-100 lb _m /ft ³	0.1-100 lb _m /ft ³		
Mass flow rate obtained by combining density (gamma attenuation technique) with volumetric flow rate (turbine flowmeter) or momentum flux (drag disc)					
<u>Intact Loop</u>					
FDU-1 GU-1VR FTU-1 GU-1VR	Hot leg, Spool 1			220, 221 222, 223	
FTU-PRIZE and GU-PRIZE	Pressurizer surge line			224, 225	
FDU-5 GU-5VR	Hot leg, Spool 5			226, 227	Data not valid prior to t=0 sec
FDU-10 GU-10VR	Cold leg, Spool 10			228, 229	
FDU-13 GU-13VR FTU-13 GU-13VR	Cold leg, Spool 13			230, 231 232, 233	FTU-13 questionable from t=13 sec to t=50 sec
FDU-15 GU-15VR FTU-15 GU-15VR	Cold leg, Spool 15			234, 235 236, 237	
<u>Broken Loop</u>					
FDB-21A GB-21AVR FTB-21A GB-21AVR	Hot leg, Spool 21			238, 239 240, 241	
FDB-23 GB-23VR	Hot leg, Spool 23			242, 243	

TABLE V (Contd.)

DATA PRESENTATION FOR SEMISCALE MOD-1 TEST S-01-1

Measurement	Location and Comments [a]	Range [a]		Figure [a]	Measurement Comments [b]
		Detector	Data Acquisition System		
<u>Broken Loop (Contd.)</u>					
FTB-30 GB-30VR	Cold leg, Spool 23			244, 245	Data not valid prior to t=0 sec; FTB-30 data erratic and FTB-30 range was exceeded
FDB-42 GB-42VR	Hot leg, Spool 42			246, 247	
<u>Vessel</u>					
FTV-CORE-IN GV-COR-150HZ	Entrance to core			248, 249	
FDV-CORE-IN GV-COR-150HZ	Entrance to core			250, 251	
PUMP CHARACTERISTICS					
PUMPU-TORQ	Pump torque	0-500 in.-lb	0-500 in.-lb	252, 253	Data not valid after t=93 sec
PUMPU-POW	Pump motor power		0-24.2 kW	254, 255	
PUMPU-RPM	Pump speed	0-3600 rpm	0-3600 rpm	256, 257	

[a] Statements at the beginning of a measurement category regarding location and comments, range, and figure apply to all subsequent measurements within the given category unless specified otherwise.

[b] Detectors which were subjected to overrange conditions during portions of the test were capable of withstanding these conditions without change in operating or measuring characteristics when the physical conditions were again within the detector range.

Fig. 6 Fluid temperatures in intact loop from -2 to 110 seconds.

Fig. 7 Fluid temperatures in intact loop from -2 to 30 seconds.

Fig. 8 Fluid temperatures in broken loop from -2 to 110 seconds.

Fig. 9 Fluid temperatures in broken loop from -2 to 30 seconds.

Fig. 10 Fluid temperatures in inlet annulus from -2 to 110 seconds.

Fig. 11 Fluid temperatures in inlet annulus from -2 to 30 seconds.

Fig. 12 Fluid temperatures in downcomer annulus (TFV-ANN-15A, TFV-ANN-15M, and TFV-ANN-15T) from -2 to 110 seconds.

Fig. 13 Fluid temperatures in downcomer annulus (TFV-ANN-15A, TFV-ANN-15M, and TFV-ANN-15T) from -2 to 30 seconds.

Fig. 14 Fluid temperatures in downcomer annulus (TFV-ANN-35A, TFV-ANN-35M, and TFV-ANN-35T) from -2 to 110 seconds.

Fig. 15 Fluid temperatures in downcomer annulus (TFV-ANN-35A, TFV-ANN-35M, and TFV-ANN-35T) from -2 to 30 seconds.

Fig. 16 Fluid temperatures in downcomer annulus (TFV-ANN-70A, TFV-ANN-115A, and TFV-ANN-156A) from -2 to 110 seconds.

Fig. 17 Fluid temperatures in downcomer annulus (TFV-ANN-70A, TFV-ANN-115A, and TFV-ANN-156A) from -2 to 30 seconds.

Fig. 18 Fluid temperatures in lower plenum from -2 to 110 seconds.

Fig. 19 Fluid temperatures in lower plenum from -2 to 30 seconds.

Fig. 20 Fluid temperature in core (LOFT) from -2 to 110 seconds.

Fig. 21 Fluid temperature in core (LOFT) from -2 to 30 seconds.

Fig. 22 Fluid temperatures in core barrel insulation gap from -2 to 110 seconds.

Fig. 23 Fluid temperatures in core barrel insulation gap from -2 to 30 seconds.

Fig. 24 Fluid temperatures in vessel filler insulation gap from -2 to 110 seconds.

Fig. 25 Fluid temperatures in vessel filler insulation gap from -2 to 30 seconds.

Fig. 26 Fluid temperatures in steam generator from -2 to 110 seconds.

Fig. 27 Fluid temperatures in steam generator from -2 to 30 seconds.

Fig. 28 Fluid temperature in pressurizer surge line from -2 to 110 seconds.

Fig. 29 Fluid temperature in pressurizer surge line from -2 to 30 seconds.

Fig. 30 Fluid temperatures in pressure suppression tank from -2 to 110 seconds.

Fig. 31 Fluid temperatures in pressure suppression tank from -2 to 30 seconds.

Fig. 32 Material temperatures in intact loop (TMU-1S16, TMU-1B16, TMU-5B16, and TMU-7S16) from -2 to 110 seconds.

Fig. 33 Material temperatures in intact loop (TMU-1S16, TMU-1B16, TMU-5B16, and TMU-7S16) from -2 to 30 seconds.

Fig. 34 Material temperatures in intact loop (TMU-8S16, TMU-10S16, TMU-15T16, and TMU-15B16) from -2 to 110 seconds.

Fig. 35 Material temperatures in intact loop (TMU-8S16, TMU-10S16, TMU-15T16, and TMU-15B16) from -2 to 30 seconds.

Fig. 36 Material temperatures in broken loop from -2 to 110 seconds.

Fig. 37 Material temperatures in broken loop from -2 to 30 seconds.

Fig. 38 Material temperatures in vessel wall from -2 to 110 seconds.

Fig. 39 Material temperatures in vessel wall from -2 to 30 seconds.

Fig. 40 Material temperatures in vessel filler outside diameter from -2 to 110 seconds.

Fig. 41 Material temperatures in vessel filler outside diameter from -2 to 30 seconds.

Fig. 42 Material temperatures in vessel filler inside diameter (TMV-FI-4M, TMV-FI-15A, TMV-FI-35A, and TMV-FI-35M) from -2 to 110 seconds.

Fig. 43 Material temperatures in vessel filler inside diameter (TMV-FI-4M, TMV-FI-15A, TMV-FI-35A, and TMV-FI-35M) from -2 to 30 seconds.

Fig. 44 Material temperatures in vessel filler inside diameter (TMV-FI-70A, TMV-FI-115A, TMV-FI-156A, TMV-FI-156M, and TMV-FI-177M) from -2 to 110 seconds.

Fig. 45 Material temperatures in vessel filler inside diameter (TMV-FI-70A, TMV-FI-115A, TMV-FI-156A, TMV-FI-156M, and TMV-FI-177M) from -2 to 30 seconds.

Fig. 46 Material temperatures in vessel filler insulator from -2 to 110 seconds.

Fig. 47 Material temperatures in vessel filler insulator from -2 to 30 seconds.

Fig. 48 Material temperature in vessel lower head from -2 to 110 seconds

Fig. 49 Material temperature in vessel lower head from -2 to 30 seconds.

Fig. 50 Material temperatures in core barrel outside diameter (TMV-CO-4A, TMV-CO-15A, TMV-CO-70A, TMV-CO-115A, and TMV-CO-115M) from -2 to 110 seconds.

Fig. 51 Material temperatures in core barrel outside diameter (TMV-CO-4A, TMV-CO-15A, TMV-CO-70A, TMV-CO-115A, and TMV-CO-115M) from -2 to 30 seconds.

Fig. 52 Material temperatures in core barrel inside diameter (TMV-CI-70A and TMV-CI-115A) from -2 to 110 seconds.

Fig. 53 Material temperatures in core barrel inside diameter (TMV-CI-70A and TMV-CI-115A) from -2 to 30 seconds.

Fig. 54 Material temperatures in steam generator from -2 to 110 seconds.

Fig. 55 Material temperatures in steam generator from -2 to 30 seconds.

Fig. 56 Pressures in broken loop hot leg vessel side of break from -2 to 110 seconds.

Fig. 57 Pressures in broken loop hot leg vessel side of break from -2 to 30 seconds.

Fig. 58 Pressures in broken loop hot leg pump side of break from -2 to 110 seconds.

Fig. 59 Pressures in broken loop hot leg pump side of break from -2 to 30 seconds.

Fig. 60 Pressures in vessel from -2 to 110 seconds.

Fig. 61 Pressures in vessel from -2 to 30 seconds.

Fig. 62 Pressure in intact loop ECC accumulator from -2 to 110 seconds.

Fig. 63 Pressure in pressurizer from -2 to 110 seconds.

Fig. 64 Pressure in pressurizer from -2 to 30 seconds.

Fig. 65 Pressure in pressure suppression tank from -2 to 110 seconds.

Fig. 66 Pressure in pressure suppression tank from -2 to 30 seconds.

Fig. 67 Differential pressure in intact loop (upper plenum to Spool 1) from -2 to 110 seconds.

Fig. 68 Differential pressure in intact loop (upper plenum to Spool 1) from -2 to 30 seconds.

Fig. 69 Differential pressure in intact loop (upper plenum to Spool 3) from -2 to 110 seconds.

Fig. 70 Differential pressure in intact loop (upper plenum to Spool 3) from -2 to 30 seconds.

Fig. 71 Differential pressure in intact loop (Spool 3 to Spool 7) from -2 to 110 seconds.

Fig. 72 Differential pressure in intact loop (Spool 3 to Spool 7) from -2 to 30 seconds.

Fig. 73 Differential pressure in intact loop, low range (Spool 3 to Spool 7) from -2 to 110 seconds.

Fig. 74 Differential pressure in intact loop, low range (Spool 3 to Spool 7) from -2 to 30 seconds.

Fig. 75 Differential pressure in intact loop (Spool 3 to steam generator inlet plenum) from -2 to 110 seconds.

Fig. 76 Differential pressure in intact loop (Spool 3 to steam generator inlet plenum) from -2 to 30 seconds.

Fig. 77 Differential pressure in intact loop (Spool 6 to steam generator inlet plenum) from -2 to 110 seconds.

Fig. 78 Differential pressure in intact loop (Spool 6 to steam generator inlet plenum) from -2 to 30 seconds.

Fig. 79 Differential pressure in intact loop (SG1 to SG2) from -2 to 110 seconds.

Fig. 80 Differential pressure in intact loop (SG1 to SG2) from -2 to 30 seconds.

Fig. 81 Differential pressure in intact loop (steam generator outlet plenum to Spool 7) from -2 to 110 seconds.

Fig. 82 Differential pressure in intact loop (steam generator outlet plenum to Spool 7) from -2 to 30 seconds.

Fig. 83 Differential pressure in intact loop (Spool 7 to Spool 10) from -2 to 110 seconds.

Fig. 84 Differential pressure in intact loop (Spool 7 to Spool 10) from -2 to 30 seconds.

Fig. 85 Differential pressure in intact loop (Spool 8C to Spool 8D) from -2 to 110 seconds.

Fig. 86 Differential pressure in intact loop (Spool 8C to Spool 8D) from -2 to 30 seconds.

Fig. 87 Differential pressure in intact loop (Spool 8D to Spool 8E) from -2 to 110 seconds.

Fig. 88 Differential pressure in intact loop (Spool 8D to Spool 8E) from -2 to 30 seconds.

Fig. 89 Differential pressure in intact loop (Spool 12 to Spool 10) from -2 to 110 seconds.

Fig. 90 Differential pressure in intact loop (Spool 12 to Spool 10) from -2 to 30 seconds.

Fig. 91 Differential pressure in intact loop, low range (Spool 12 to Spool 10) from -2 to 110 seconds.

Fig. 92 Differential pressure in intact loop, low range (Spool 12 to Spool 10) from -2 to 30 seconds.

Fig. 93 Differential pressure in intact loop (Spool 12 to Spool 15) from -2 to 110 seconds.

Fig. 94 Differential pressure in intact loop (Spool 12 to Spool 15) from -2 to 30 seconds.

Fig. 95 Differential pressure in intact loop (Spool 15 to Spool 1) from -2 to 110 seconds.

Fig. 96 Differential pressure in intact loop (Spool 15 to Spool 1) from -2 to 30 seconds.

Fig. 97 Differential pressure in intact loop, low range (Spool 15 to Spool 1) from -2 to 110 seconds.

Fig. 98 Differential pressure in intact loop, low range (Spool 15 to Spool 1) from -2 to 30 seconds.

Fig. 99 Differential pressure in intact loop (Spool 15 to vessel inlet annulus) from -2 to 110 seconds.

Fig. 100 Differential pressure in intact loop (Spool 15 to vessel inlet annulus) from -2 to 30 seconds.

Fig. 101 Differential pressure in intact loop (Spool 15 to atmosphere) from -2 to 110 seconds.

Fig. 102 Differential pressure in intact loop (pressurizer liquid level) from -2 to 110 seconds.

Fig. 103 Differential pressure in intact loop (pressurizer liquid level) from -2 to 30 seconds.

Fig. 104 Differential pressure in broken loop (vessel upper plenum to Spool 21A) from -2 to 110 seconds.

Fig. 105 Differential pressure in broken loop (vessel upper plenum to Spool 21A) from -2 to 30 seconds.

Fig. 106 Differential pressure in broken loop (Spool 21A to Spool 23) from -2 to 110 seconds.

Fig. 107 Differential pressure in broken loop (Spool 21A to Spool 23) from -2 to 30 seconds.

Fig. 108 Differential pressure in broken loop (Spool 23 to vessel-side nozzle throat) from -2 to 110 seconds.

Fig. 109 Differential pressure in broken loop (Spool 23 to vessel-side nozzle throat) from -2 to 30 seconds.

Fig. 110 Differential pressure in broken loop (vessel-side nozzle throat to divergent section) from -2 to 110 seconds.

Fig. 111 Differential pressure in broken loop (vessel-side nozzle throat to divergent section) from -2 to 30 seconds.

Fig. 112 Differential pressure in broken loop (Spool 23 to Spool 24) from -2 to 110 seconds.

Fig. 113 Differential pressure in broken loop (Spool 23 to Spool 24) from -2 to 30 seconds.

Fig. 114 Differential pressure in broken loop (vessel inlet annulus to Spool 30) from -2 to 110 seconds.

Fig. 115 Differential pressure in broken loop (vessel inlet annulus to Spool 30) from -2 to 30 seconds.

Fig. 116 Differential pressure in broken loop (Spool 30 to Spool 40) from -2 to 110 seconds.

Fig. 117 Differential pressure in broken loop (Spool 30 to Spool 40) from -2 to 30 seconds.

Fig. 118 Differential pressure in broken loop (Spool 40 to Spool 38) from -2 to 110 seconds.

Fig. 119 Differential pressure in broken loop (Spool 40 to Spool 38) from -2 to 30 seconds.

Fig. 120 Differential pressure in broken loop, low range (Spool 40 to Spool 38) from -2 to 110 seconds.

Fig. 121 Differential pressure in broken loop (Spool 38 to Spool 36U) from -2 to 110 seconds.

Fig. 122 Differential pressure in broken loop (Spool 38 to Spool 36U) from -2 to 30 seconds.

Fig. 123 Differential pressure in broken loop (Spool 37 to Spool 36U) from -2 to 110 seconds.

Fig. 124 Differential pressure in broken loop (Spool 37 to Spool 36U) from -2 to 30 seconds.

Fig. 125 Differential pressure in broken loop (Spool 37 to Spool 42) from -2 to 110 seconds.

Fig. 126 Differential pressure in broken loop (Spool 37 to Spool 42) from -2 to 30 seconds.

Fig. 127 Differential pressure in broken loop (Spool 36U to Spool 32L) from -2 to 110 seconds.

Fig. 128 Differential pressure in broken loop (Spool 36U to Spool 32L) from -2 to 30 seconds.

Fig. 129 Differential pressure in broken loop (Spool 42 to Spool 43) from -2 to 110 seconds.

Fig. 130 Differential pressure in broken loop (Spool 42 to Spool 43) from -2 to 30 seconds.

Fig. 131 Differential pressure in broken loop (Spool 42 to pump-side nozzle throat) from -2 to 110 seconds.

Fig. 132 Differential pressure in broken loop (Spool 42 to pump-side nozzle throat) from -2 to 30 seconds.

Fig. 133 Differential pressure in broken loop (pump-side nozzle throat to divergent section) from -2 to 110 seconds.

Fig. 134 Differential pressure in broken loop (pump-side nozzle throat to divergent section) from -2 to 30 seconds.

Fig. 135 Differential pressure in broken loop (pump-side nozzle divergent section to Spool 43) from -2 to 110 seconds.

Fig. 136 Differential pressure in broken loop (pump-side nozzle divergent section to Spool 43) from -2 to 30 seconds.

Fig. 137 Differential pressure in vessel (upper plenum to inlet annulus) from -2 to 110 seconds.

Fig. 138 Differential pressure in vessel (upper plenum to inlet annulus) from -2 to 30 seconds.

Fig. 139 Differential pressure in vessel (DPV-9-26QQ) from -2 to 110 seconds.

Fig. 140 Differential pressure in vessel (DPV-9-26QQ) from -2 to 30 seconds.

Fig. 141 Differential pressure in vessel (DPV-9-180QQ) from -2 to 110 seconds.

Fig. 142 Differential pressure in vessel (DPV-9-180QQ) from -2 to 30 seconds.

Fig. 143 Differential pressure in vessel (DPV-26-55QM) from -2 to 110 seconds.

Fig. 144 Differential pressure in vessel (DPV-26-55QM) from -2 to 30 seconds.

Fig. 145 Differential pressure in vessel (DPV-55-110AM) from -2 to 110 seconds.

Fig. 146 Differential pressure in vessel (DPV-55-110AM) from -2 to 30 seconds.

Fig. 147 Differential pressure in vessel (DPV-110-156MQ) from -2 to 110 seconds.

Fig. 148 Differential pressure in vessel (DPV-110-156MQ) from -2 to 30 seconds.

Fig. 149 Differential pressure in vessel (DPV-156-173QQ) from -2 to 110 seconds.

Fig. 150 Differential pressure in vessel (DPV-156-173QQ) from -2 to 30 seconds.

Fig. 151 Differential pressure in vessel (DPV-166-173QQ) from -2 to 110 seconds.

Fig. 152 Differential pressure in vessel (DPV-166-173QQ) from -2 to 30 seconds.

Fig. 153 Differential pressure in vessel (DPV-166-191QT) from -2 to 110 seconds.

Fig. 154 Differential pressure in vessel (DPV-166-191QT) from -2 to 30 seconds.

Fig. 155 Differential pressure in steam generator secondary (secondary liquid level) from -2 to 110 seconds.

Fig. 156 Differential pressure in steam generator secondary (secondary liquid level) from -2 to 30 seconds.

Fig. 157 Volumetric flows in intact loop (FTU-1 and FTU-9) from -2 to 110 seconds.

Fig. 158 Volumetric flows in intact loop (FTU-1 and FTU-9) from -2 to 30 seconds.

Fig. 159 Volumetric flows in intact loop (FTU-13 and FTU-15) from -2 to 110 seconds.

Fig. 160 Volumetric flows in intact loop (FTU-13 and FTU-15) from -2 to 30 seconds.

Fig. 161 Volumetric flows in broken loop (FTB-21A, FTB-30, and FTB-37) from -2 to 110 seconds.

Fig. 162 Volumetric flows in broken loop (FTB-21A, FTB-30, and FTB-37) from -2 to 30 seconds.

Fig. 163 Volumetric flow in core entrance from -2 to 110 seconds.

Fig. 164 Volumetric flow in core entrance from -2 to 30 seconds.

Fig. 165 Volumetric flow from high-pressure injection system from -2 to 110 seconds.

Fig. 166 Volumetric flow from high-pressure injection system from -2 to 30 seconds.

Fig. 167 Volumetric flow from low-pressure injection system from -2 to 110 seconds.

Fig. 168 Volumetric flow from intact loop accumulator from -2 to 110 seconds.

Fig. 169 Volumetric flow from pressurizer from -2 to 110 seconds.

Fig. 170 Volumetric flow from pressurizer from -2 to 30 seconds.

Fig. 171 Volumetric flow from pressure suppression spray system from -2 to 110 seconds.

Fig. 172 Fluid velocity in vessel (FTV-22M) from -2 to 110 seconds.

Fig. 173 Fluid velocity in vessel (FTV-22M) from -2 to 30 seconds.

Fig. 174 Fluid velocity in vessel (FTV-40A) from -2 to 110 seconds.

Fig. 175 Fluid velocity in vessel (FTV-40A) from -2 to 30 seconds.

Fig. 176 Fluid velocity in vessel (FTV-40M) from -2 to 110 seconds.

Fig. 177 Fluid velocity in vessel (FTV-40M) from -2 to 30 seconds.

Fig. 178 Fluid velocity in vessel (FTV-83A) from -2 to 110 seconds.

Fig. 179 Fluid velocity in vessel (FTV-83A) from -2 to 30 seconds.

Fig. 180 Fluid velocity in vessel (FTV-83M) from -2 to 110 seconds.

Fig. 181 Fluid velocity in vessel (FTV-83M) from -2 to 30 seconds.

Fig. 182 Momentum flux in intact loop (Spool 1) from -2 to 110 seconds.

Fig. 183 Momentum flux in intact loop (Spool 1) from -2 to 30 seconds.

Fig. 184 Momentum flux in intact loop (Spool 5) from -2 to 110 seconds.

Fig. 185 Momentum flux in intact loop (Spool 5) from -2 to 30 seconds.

Fig. 186 Momentum flux in intact loop (Spool 10) from -2 to 110 seconds.

Fig. 187 Momentum flux in intact loop (Spool 10) from -2 to 30 seconds.

Fig. 188 Momentum flux in intact loop (Spool 13) from -2 to 110 seconds.

Fig. 189 Momentum flux in intact loop (Spool 13) from -2 to 30 seconds.

Fig. 190 Momentum flux in intact loop (Spool 15) from -2 to 110 seconds.

Fig. 191 Momentum flux in intact loop (Spool 15) from -2 to 30 seconds.

Fig. 192 Momentum flux in broken loop (Spool 21A) from -2 to 110 seconds.

Fig. 193 Momentum flux in broken loop (Spool 21A) from -2 to 30 seconds.

Fig. 194 Momentum flux in broken loop (Spool 23) from -2 to 110 seconds.

Fig. 195 Momentum flux in broken loop (Spool 23) from -2 to 30 seconds.

Fig. 196 Momentum flux in broken loop (Spool 37) from -2 to 110 seconds.

Fig. 197 Momentum flux in broken loop (Spool 37) from -2 to 30 seconds.

Fig. 198 Momentum flux in broken loop (Spool 42) from -2 to 110 seconds.

Fig. 199 Momentum flux in broken loop (Spool 42) from -2 to 30 seconds.

Fig. 200 Momentum flux in core entrance from -2 to 110 seconds.

Fig. 201 Momentum flux in core entrance from -2 to 30 seconds.

Fig. 202 Densities in intact loop (GU-1VR and GU-1HZ) from -2 to 110 seconds.

Fig. 203 Densities in intact loop (GU-1VR and GU-1HZ) from -2 to 30 seconds.

Fig. 204 Densities in intact loop (GU-5VR and GU-10VR) from -2 to 110 seconds.

Fig. 205 Densities in intact loop (GU-5VR and GU-10VR) from -2 to 30 seconds.

Fig. 206 Density in intact loop (GU-13VR) from -2 to 110 seconds.

Fig. 207 Density in intact loop (GU-13VR) from -2 to 30 seconds.

Fig. 208 Densities in intact loop (GU-15VR and GU-15HZ) from -2 to 110 seconds.

Fig. 209 Densities in intact loop (GU-15VR and GU-15HZ) from -2 to 30 seconds.

Fig. 210 Densities in broken loop (GB-21AVR and GB-23VR) from -2 to 110 seconds.

Fig. 211 Densities in broken loop (GB-21AVR and GB-23VR) from -2 to 30 seconds.

Fig. 212 Densities in broken loop (GB-30VR and GB-42VR) from -2 to 110 seconds.

Fig. 213 Densities in broken loop (GB-30VR and GB-42VR) from -2 to 30 seconds.

Fig. 214 Densities in vessel (GV-COR-150HZ and GV-161/192D) from -2 to 110 seconds.

Fig. 215 Densities in vessel (GV-COR-150HZ and GV-161/192D) from -2 to 30 seconds.

Fig. 216 Density in vessel (GVLP-172HZ) from -2 to 110 seconds.

Fig. 217 Density in vessel (GVLP-172HZ) from -2 to 30 seconds.

Fig. 218 Density in pressurizer from -2 to 110 seconds.

Fig. 219 Density in pressurizer from -2 to 30 seconds.

Fig. 220 Mass flow in intact loop (FDU-1 and GU-1VR) from -2 to 110 seconds.

Fig. 221 Mass flow in intact loop (FDU-1 and GU-1VR) from -2 to 30 seconds.

Fig. 222 Mass flow in intact loop (FTU-1 and GU-1VR) from -2 to 110 seconds.

Fig. 223 Mass flow in intact loop (FTU-1 and GU-1VR) from -2 to 30 seconds.

Fig. 224 Mass flow from pressurizer from -2 to 110 seconds.

Fig. 225 Mass flow from pressurizer from -2 to 30 seconds.

Fig. 226 Mass flow in intact loop (FDU-5 and GU-5VR) from -2 to 110 seconds.

Fig. 227 Mass flow in intact loop (FDU-5 and GU-5VR) from -2 to 30 seconds.

Fig. 228 Mass flow in intact loop (FDU-10 and GU-10VR) from -2 to 110 seconds.

Fig. 229 Mass flow in intact loop (FDU-10 and GU-10VR) from -2 to 30 seconds.

Fig. 230 Mass flow in intact loop (FDU-13 and GU-13VR) from -2 to 110 seconds.

Fig. 231 Mass flow in intact loop (FDU-13 and GU-13VR) from -2 to 30 seconds.

Fig. 232 Mass flow in intact loop (FTU-13 and GU-13VR) from -2 to 110 seconds.

Fig. 233 Mass flow in intact loop (FTU-13 and GU-13VR) from -2 to 30 seconds.

Fig. 234 Mass flow in intact loop (FDU-15 and GU-15VR) from -2 to 110 seconds.

Fig. 235 Mass flow in intact loop (FDU-15 and GU-15VR) from -2 to 30 seconds.

Fig. 236 Mass flow in intact loop (FTU-15 and GU-15VR) from -2 to 110 seconds.

Fig. 237 Mass flow in intact loop (FTU-15 and GU-15VR) from -2 to 30 seconds.

Fig. 238 Mass flow in broken loop (FDB-21A and GB-21AVR) from -2 to 110 seconds.

Fig. 239 Mass flow in broken loop (FDB-21A and GB-21AVR) from -2 to 30 seconds.

Fig. 240 Mass flow in broken loop (FTB-21A and GB-21AVR) from -2 to 110 seconds.

Fig. 241 Mass flow in broken loop (FTB-21A and GB-21AVR) from -2 to 30 seconds.

Fig. 242 Mass flow in broken loop (FDB-23 and GB-23VR) from -2 to 110 seconds.

Fig. 243 Mass flow in broken loop (FDB-23 and GB-23VR) from -2 to 30 seconds.

Fig. 244 Mass flow in broken loop (FTB-30 and GB-30VR) from -2 to 110 seconds.

Fig. 245 Mass flow in broken loop (FTB-30 and GB-30VR) from -2 to 30 seconds.

Fig. 246 Mass flow in broken loop (FDB-42 and GB-42VR) from -2 to 110 seconds.

Fig. 247 Mass flow in broken loop (FDB-42 and GB-42VR) from -2 to 30 seconds.

Fig. 248 Mass flow in vessel (FTV-CORE-IN and GV-COR-150HZ) from -2 to 110 seconds.

Fig. 249 Mass flow in vessel (FTV-CORE-IN and GV-COR-150HZ) from -2 to 30 seconds.

Fig. 250 Mass flow in vessel (FDV-CORE-IN and GV-COR-150HZ) from -2 to 110 seconds.

Fig. 251 Mass flow in vessel (FDV-CORE-IN and GV-COR-150HZ) from -2 to 30 seconds.

Fig. 252 Primary pump torque from -2 to 110 seconds.

Fig. 253 Primary pump torque from -2 to 30 seconds.

Fig. 254 Primary pump power from -2 to 110 seconds.

Fig. 255 Primary pump power from -2 to 30 seconds.

Fig. 256 Primary pump speed from -2 to 110 seconds.

Fig. 257 Primary pump speed from -2 to 30 seconds.

Fig. 258 Fluid temperatures in vessel (TFV-LOFT-COR, TFV-ANN-156A, and TFV-LP-7-1/2) from -2 to 230 seconds.

Fig. 259 Fluid temperatures in pressure suppression tank from -2 to 230 seconds.

Fig. 260 Pressure in intact loop ECC accumulator from -2 to 230 seconds.

Fig. 261 Pressure in pressure suppression tank from -2 to 230 seconds.

Fig. 262 Differential pressure in intact loop (DPU-15-ATM) from -2 to 230 seconds.

Fig. 263 Differential pressure in intact loop (pressurizer liquid level) from -2 to 230 seconds.

Fig. 264 Volumetric flow from intact loop accumulator from -2 to 230 seconds.

Fig. 265 Volumetric flow from pressure suppression spray system from -2 to 230 seconds.

Fig. 266 Momentum flux in core entrance from -2 to 230 seconds.

Fig. 267 Densities in vessel (GV-COR-150HZ and GV-161/192D) from -2 to 230 seconds.

IV. REFERENCES

1. S. N. Zender, *Experiment Data Report for Semiscale Mod-1 Test S-01-2 (Isothermal Blowdown with Core Resistance Simulator)*, ANCR-1194 (February 1975).
2. S. N. Zender, *Experiment Data Report for Semiscale Mod-1 Test S-01-3 (Isothermal Blowdown with Core Resistance Simulator)*, ANCR-1195 (March 1975).
3. S. N. Zender, M. F. Jensen, K. E. Sackett, *Experiment Data Report for Semiscale Mod-1 Tests S-01-4 and S-01-4A (Isothermal Blowdown with Core Resistance Simulator)*, ANCR-1196 (March 1975).
4. S. N. Zender, H. S. Crapo, M. F. Jensen, K. E. Sackett, *Experiment Data Report for Semiscale Mod-1 Test S-01-5 (Isothermal Blowdown with Core Resistance Simulator)*, ANCR-1197 (April 1975).

DISTRIBUTION RECORD FOR ANCR-1198

External

231 - UC-78a (TID-4500, R-62) Light Water Reactor Safety & Technology -
System Interactions & Effects

Internal

2 - H. J. C. Kouts, NRC
Washington, D.C. 20555

2 - R. W. Barber, RSRC-ERDA
Washington, D.C. 20545

1 - W. Bixby, NRC
Washington, D.C. 20555

1 - Chicago Patent Group - ERDA
9800 South Cass Ave.
Argonne, Illinois 60439

3 - A. T. Morphew, Classification & Technical Information Officer
ERDA-ID
Idaho Falls, Idaho 83401

1 - R. J. Beers, ERDA-ID

1 - P. E. Litteneker, ERDA-ID

1 - R. E. Swanson, ERDA-ID

1 - V. A. Walker, ERDA-ID

1 - R. E. Wood, ERDA-ID

11 - INEL Technical Library

42 - ANC Internal Distribution

70 - Author

Total Copies Printed - 368