

LOFT TECHNICAL REPORT LTR 1111-46

JULY 27, 1978

LOFT FUEL PROTOTYPES, MODELS, AND MOCKUPS

M. L. Russell

MASTER



EG&G Idaho, Inc.



IDAHO NATIONAL ENGINEERING LABORATORY

DEPARTMENT OF ENERGY

IDAHO OPERATIONS OFFICE UNDER CONTRACT EY-76-C-07-1570

DISTRIBUTION OF THIS DOCUMENT IS 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.



LOFT TECHNICAL REPORT
LOFT PROGRAM

FORM EG&G-229
(Rev. 12-78)

TITLE LOFT Fuel Prototypes, Models, and Mockups		REPORT NO. LTR 1111-46
AUTHOR M. L. Russell <i>M. L. Russell</i>	GWA NO.	
PERFORMING ORGANIZATION LOFT	DATE July 27, 1978 <i>JR</i>	
LOFT APPROVAL <i>M. L. Russell</i> <i>[Signature]</i> <i>[Signature]</i>		

PSE
[Signature] P&CSB Mgr.

LEPD Mgr. LESD Mgr. RSB Mgr.

RSB Mgr.
[Signature]

[Signature]
7-24-78 SUMMARY

This LTR provides a list of and information concerning the prototypes, models, and mockups that were constructed for LOFT Fuel design verification tests, proof-of-fabrication demonstrations, and operator training qualifications.

NOTICE

This report was prepared as an account of work sponsored by the United States Government. Neither the United States nor the United States Department of Energy, 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.

ef

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

Prototypes, Models, and Mockups

Purpose: The conduct of design verification tests, proof-of-fabrication demonstrations, and operator training qualifications required that the prototypes, models, and mockups contained in the attached table be procured and/or fabricated. Many other units (such as instrumented heater rods for ANC tests, pressurizable end caps for proof-of-fabrication demonstrations, spacer grid intersections for strength tests, instrumentation penetration braze button mockups for proof testing and proof-of-fabrication demonstrations) have also been fabricated but are too numerous to list here.

TABLE 2-VI

LOFT CORE I FUEL MODULE PROTOTYPES, MODELS, AND MOCKUPS

Description	Details	Source	Remarks
A. <u>Fuel Modules</u>			
1. Center (Type A) fuel module prototype	206157	ANC	For use in ANC fuel module proof-of-fabrication demonstration and fuel handling activities
2. Control (Type B) fuel module prototype	204994	ANC	For use in ANC fuel module proof-of-fabrication demonstration and fuel handling activities
3. Corner (Type C) fuel module prototype	204995	ANC	For use in ANC fuel module proof-of-fabrication demonstration and fuel handling activities
B. <u>Fuel Bundles</u>			
1. Center (Type A) fuel bundle prototype	JN-300973 Rev. 2	XNC	Fretting-corrosion and pressure drop test bundle and proof-of-fabrication demonstration
2. Corner (Type C) fuel bundle prototype	JN-301261 Rev. 6	XNC	Fretting-corrosion and pressure drop test bundle and proof-of-fabrication demonstration
3. Center (Type A) fuel bundle model	JN-301127 Rev. 0	XNC	LDV/flow distribution test then converted to Type B mockup
4. Control (Type B) fuel bundle mockup (top end box does not have flow holes)	XN-301663 Rev. 0 XN-S30349 Rev. 0 (Specification)	XNC	XNC used for proof-of-fabrication demonstration then converted to Type B pressure drop test bundle before reconversion to Type B mockup for ANC proof-of-fabrication demonstration
5. Control (Type B) fuel module model	XN-301663 Rev. 2	XNC	Proposed pressure drop tests then conversion to control fuel bundle mockup (Item B.4)

LTR 1111-46

(Continued)

TABLE 2-VI

LOFT CORE I FUEL MODULE PROTOTYPES, MODELS, AND MOCKUPS

Description	Details	Source	Remarks
6. Center (Type A) fuel bundle model without liquid-level detectors	XN-301660 Rev. 0	XNC	XNC fuel bundle strength test
7. Center (Type A) fuel bundle portion with wart spacers and simulated thermocouple attachment by resistance welding	Unavail.	Columbia University via XNC	DNB test (see JN-S30113, paragraph 2.2)
8. Center (Type A) fuel bundle portion with LOFT spacers and simulated thermocouple attachment by laser welding	Unavail.	Columbia University via XNC	DNB test (see JN-S30113, paragraph 4.2)
9. Center (Type A) fuel bundle portion with LOFT spacers and simulated thermocouple attachment by laser welding	Unavail.	Columbia University via XNC	Coolant mixing test (see JN-S30114, paragraph 2.2) bundle has exaggerated heater rod power differences
10. Control (Type B) fuel bundle mockup	JN-301164 Rev. 1	XNC	XNC RCC drop test
11. Center (Type A) fuel bundle mockup	205078 Rev. A	ANC	For use in ANC fuel module proof-of-fabrication demonstration
12. Corner (Type C) fuel bundle mockup	205077 Rev. A	ANC	For use in ANC fuel module proof-of-fabrication demonstration
C. <u>Upper Support Structure</u>			
1. Center (Type A) prototype	204390 Rev. J	L&S	For use in L&S and ANC fuel module proof-of-fabrication demonstration

LTR 1111-46

(Continued)

TABLE 2-VI

LOFT CORE I FUEL MODULE PROTOTYPES, MODELS, AND MOCKUPS

Description	Details	Source	Remarks
2. Control (Type B) prototype	204386 Rev. F 204387 Rev. E	L&S	For use in L&S proof-of-fabrication demonstration, XNC pressure drop tests and ANC proof-of-fabrication demonstration
3. Corner (Type C) prototype	204389 Rev. G	L&S	For use in L&S and ANC fuel module proof-of-fabrication demonstration
4. Control (Type B) mockup	205076 Rev. C 204387 Rev. D	L&S	For use in XNC RCC drop tests
5. Center (Type A) lower section (36 inches) model			
a. original	204628 Rev. 0 204634 Rev. 0	ANC	For use in XNC fretting-corrosion and pressure drop tests (initial 150 hours)
b. with replaceable density velocity detector	204628 Rev. A 204634 Rev. A	ANC	For use in XNC fretting-corrosion and pressure drop tests (1500 hour endurance)
c. with orifice plate	204628 Rev. B. 204634 Rev. B	L&S mod.	For use in XNC pressure drop tests
6. Corner (Type C) lower section (16 inches) model			
a. original	204635 Rev. A	ANC & L&S	For use in XNC fretting-corrosion and pressure drop tests (initial)
b. with lateral flow relief	204635 Rev. B.	L&S mod.	For use in XNC fretting-corrosion and pressure drop tests (1500 hour endurance)

-4-

LTR 1111-46

(continued)
TABLE 2-VI

LOFT CORE I FUEL MODULE PROTOTYPES, MODELS, AND MOCKUPS

Description	Details	Source	Remarks
D. <u>Control Rods</u>			
1. Control rod prototype	XN-300358	XNC	Proof-of-fabrication demonstration, RCC drop test and control fuel bundle pressure drop test
2. Control rod mockup without SS poison section	XN-301249 Rev. 1 XN-S30348 Rev. 0 (Specification)	XNC	For ANC control fuel module proof-of-fabrication demonstration and fuel handling activities
3. Control rod free-passage gage	LS-204387-S	L&S	Gage for upper support structure
E. Neutron Source Mockup Without Source (Californium)	XN-300496 Rev. 0	XNC	For use in XNC Type C fretting-corrosion and pressure drop tests and ANC fuel module handling activities
F. Instrumentation Penetration Instrumentation Support Arm (Type B)	204720 Gp. 1	UPM	Proof-of-fabrication demonstration
G. <u>Miscellaneous</u>			
1. Lower end boxes model (entire core cross section)	E-LFT-150-009 Rev. 0 (CE)	CE	For use in CE LOFT core inlet flow distribution and pressure drop test
2. Instrumented guide tubes			(In addition to Type A and C prototype units)
a. Twelve-inch sections (2) with 4 guide tube thermocouple mockups	Unavailable	XNC	For use in XNC LOFT thermal-cycling and corrosion tests
b. Instrumentation Assembly #1 prototype	JN-300413 Rev. 3	XNC	Proof-of-fabrication demonstration
c. Instrumentation Assembly #3 prototype	JN-300413 Rev. 3	XNC	Proof-of-fabrication demonstration

(Continued)

TABLE 2-VI

LOFT CORE I FUEL MODULE PROTOTYPES, MODELS, AND MOCKUPS

Description	Details	Source	Remarks
d. Instrumentation Assembly #4 prototype	JN-300413 Rev. 3	XNC	Proof-of-fabrication demonstration
e. Instrumentation Assembly #5 prototype	JN-300413 Rev. 3	XNC	Proof-of-fabrication demonstration