



LAWRENCE
LIVERMORE
NATIONAL
LABORATORY

Preservation and Dissemination of the Hardcopy Documentation Portion of the NCSP Nuclear Criticality Bibliographic Database

B. L. Koponen, D. Heinrichs

May 20, 2009

Topical Meeting of the ANS Nuclear Criticality Safety Division
Richland, WA, United States
September 13, 2009 through September 17, 2009

Disclaimer

This document was prepared as an account of work sponsored by an agency of the United States government. Neither the United States government nor Lawrence Livermore National Security, LLC, nor any of their employees makes any warranty, expressed 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 Lawrence Livermore National Security, LLC. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States government or Lawrence Livermore National Security, LLC, and shall not be used for advertising or product endorsement purposes.

PRESERVATION AND DISSEMINATION OF THE HARDCOPY DOCUMENTATION PORTION OF THE NCSP NUCLEAR CRITICALITY BIBLIOGRAPHIC DATABASE

Brian L. Koponen *koponen1@llnl.gov* and David Heinrichs

Lawrence Livermore National Laboratory: P.O Box 808, Livermore CA 94550

The U.S. Department of Energy supports a nuclear criticality safety bibliographic internet database that contains approximately 15,000 records. We are working to ensure that a substantial portion of the corresponding hardcopy documents are preserved, digitized, and made available to criticality safety practitioners via the Nuclear Criticality Safety Program web site.

I. INTRODUCTION

A large number of criticality safety documents have been collected at the Lawrence Livermore National Laboratory (LLNL). Documents in this collection are dated as early as 1943. Authorship includes such notables as Fermi, Bethe, Feynman, and Kahn. This collection was begun at the Lawrence Radiation Laboratory (as it was known at the time) and eventually provided data for a bibliographic database located on mainframe computers (so long ago input was prepared on punched cards). The bibliography was originally intended for use by Livermore staff members but criticality safety "pioneers" such as Hugh Paxton and Dixon Callihan encouraged us to make the database available to the broader criticality safety community and even contributed copies of their bibliographies and reports. We believe that they would also have supported the inclusion of virtual copies of the full-text documents in the database although the technology at the time was not yet practicable. Current technology is now available to bring this to fruition. LLNL now maintains a Web site as part of the *Information Preservation and Dissemination* task, prescribed in the DOE's Nuclear Criticality Safety Program (NCSP) Five Year Plan. The bibliographic database and other criticality safety resources are available at <http://ncsp.llnl.gov>. The bibliography now includes approximately 15,000 records. About 1300 reports are already available in digital format and links are provided to them in the database. Table I summarizes documents in hardcopy format that we consider to be candidates for the scanning effort. The Dyer-Thomas document collection (which resides at Oak Ridge National Laboratory) is discussed later in this paper.

TABLE I. Documents Available for Possible Scanning

Document Source	Number of Documents
Hardcopies in Our File Cabinets	2,500
Conference Papers	1,400
ANS Transactions	2,500
Nuclear Science and Engineering	460
Nuclear Technology/Nuclear Applications	280
Dyer-Thomas Documents	1,000

II. DISCUSSION

The document collection preserves a knowledge base that is becoming unavailable by direct contact with the authors through the passage of time. The reports dealing with critical experiments have been a useful resource for International Handbook of Evaluated Criticality Safety Benchmark Experiments evaluators. Bibliographic information available on the NCSP web site can assist a criticality safety specialist to determine whether a document is of value; however the traditional document acquisition process can be difficult, time consuming, and costly. Many useful internal reports are not easily obtained. Even in the LLNL collection there are old reports that are considerably degraded. Eventual dispersal of the document collections or even storage at a federal records center could make the scanning effort unpractical in the future. Work has been done to collect original experiment logbooks, drawings, photographs, and other documentation into archives at Los Alamos National Laboratory. Robert Rothe¹ has noted, however, that a physical archive is not without risk:

"The disastrous fire of the summer of 2000 which threatened the city of Los Alamos was also a potential worry with respect to the Archives. After the more important concern of human safety was abated, concern focused on whether or not the fire would engulf the Archives. If it had, not only would Rocky Flats documents have been lost but countless other irreplaceable documents from many locations would have been consumed or badly damaged. Fingers of the fire approached to within a mile of the Archives; but, happily, no holdings were lost."

A digital archive of criticality documents would not be subject to a similar risk.

III. DESCRIPTION OF THE WORK

Scanned images of some of the documents have been made available via the NCSP Web Site. The name of each scanned file corresponds to the physical document location. A Hewlett Packard Scanjet 8300 Series scanner is being used which provides quick multi-page scans (2-sided when required). The documents are being scanned to PDF format with resolution of 300ppi. Most are in Black & White but color is used when required.

Considerable work had to be done before the scanning phase could begin. Over the years programs at LLNL came and went and the collection, although preserved, was not maintained in a state where the linkage to the database was intact. The document collection contains mostly printed reports but includes several hundred in microfiche format. Until recently the documents resided in a vault in file cabinets that were sorted roughly by report number. Our administrative staff members had diligently attempted to organize and label the file contents. However, it was a tedious and unrewarding task for the staff to attempt to identify, sort, and label (by hand) the large volume of documents. The effort thus had not gotten very far. When it became necessary to remove the collection from the vault the situation further declined: the collection was loaded into boxes, moved into a spare office and was almost unusable. At this time it was determined that the bibliographic database would be the best resource to help restore the collection into a usable state. The database-document linkage was completed. The records corresponding to the available hardcopy reports were downloaded into Microsoft Word format and Word was used to prepare folder labels. Once the documents were placed into labeled folders they were sorted within the file cabinets by report number. After several months of effort this phase of the work was completed; a hardcopy index was prepared and the documents are now easily retrievable and available for scanning.

At this time we are not scanning papers presented in journals or other documents that have copyright issues however, we wish to obtain ANS permission to include copies of criticality safety paper summaries published in the ANS Transactions (since many of these have already been republished in earlier collections). We have copies of most of the summaries in an easy-to-scan format (i.e., separated from the bound volumes). If possible, we would like to include criticality safety papers published in other ANS publications which include Nuclear Science and Engineering, Nuclear Technology, and topical meeting proceedings. Other non-ANS conference proceedings may be scanned but we will first ensure that copyright protections are preserved.

Table II provides a summary of many conferences that include documents relevant to nuclear criticality. The table displays the number of papers listed in our database (DB) vs. those available to us in hard-copy (HC) format. We expect that there are more papers available for some of the listed conferences but the total number of papers in some of the conferences remain unknown until we obtain copies of the conference proceedings.

TABLE II. Status of Conference Papers in Our Database and Hardcopy Collection

Organization	Year	Description	Number of Papers	
			DB	HC
ANS	1966	Topical Meeting on Nuclear Criticality Safety, Las Vegas, Nevada, Dec. 13-15, 1966	28	28
ANS	1980	Topical Meeting, El Paso, Texas, April 1980	34	34
ANS	1989	International Meeting on Nuclear Criticality Safety Margins, San Francisco, CA (USA), 26 Nov - 1 Dec 1989	26	0
ANS	1993	Topical Meeting on Physics and Methods in Criticality Safety, Sept. 19-23, 1993, Nashville, TN	39	39
ANS	1997	Topical Meeting on Criticality Safety Challenges in the Next Decade, Chelan, WA, 7-11 Sep 1997	63	62
ANS	2001	Embedded Topical Meeting on Practical Implementation of Nuclear Criticality Safety, Reno, NV (US), 11/11/2001-11/15/2001	77	0
ANS	2005	Criticality Safety Division Topical Meeting, Knoxville, Tennessee, September 18-25, 2005	73	0
DOE	1985	Workshop on Subcritical Reactivity Measurements, August 26-29, 1985, Albuquerque, NM, USA	32	32
DOE	1988	Criticality Alarm Systems Workshop, Richland, Washington, Sept. 20-22, 1988	16	16
DOE	1988	Workshop on the Use of Burnup Credit in Spent Fuel Transport Casks, Washington, DC (USA), 21-22 Feb 1988	5	0
DOE	1993	Annual Nuclear Criticality Safety Technology Project Workshop, Monterey, CA (United States), 16-20 April, 1993	30	2
DOE	1995	Nuclear Criticality Technology and Safety Project (NCTSP) Annual Meeting, San Diego, CA (United States), 17 May 1995	22	0
ICNC	1983	Int. Seminar Criticality Studies Program and Needs, Dijon, France, Sept. 1983	10	2
ICNC	1987	International Seminar on Nuclear Criticality Safety, Tokyo, Oct. 19-23, 1987	85	85

ICNC	1991	ICNC '91-International Conference on Nuclear. Criticality Safety, Oxford, U.K., Sept. 9-13, 1991	104	104
ICNC	1995	Fifth International Conference on Nuclear Criticality Safety, Sept. 17-21, 1995, Albuquerque, NM	145	145
ICNC	1999	Sixth International Conference on Nuclear Criticality Safety, Palais des Congres, Versailles, France, September 20-24, 1999	198	198
ICNC	2003	Seventh International Conference on Nuclear Criticality Safety, October 20-24, 2003, Tokai, Ibaraki, Japan	162	162
ICNC	2007	Eighth International Conference on Nuclear Criticality Safety, May 28 - June 1, 2007, St. Petersburg, Russia	182	182
UN/IAEA	1955	First United Nations International Conference on the Peaceful Uses of Atomic Energy, Geneva, Switzerland, 8-20 August 1955	16	12
UN/IAEA	1957	French-American Conference on Graphite Reactors, November 12 to 15, 1957	10	10
UN/IAEA	1958	Second United Nations International Conference on the Peaceful Uses of Atomic Energy, Geneva, Switzerland, 1-13 September 1958	79	79
UN/IAEA	1961	Criticality Control in Chemical and Metallurgical Plant, Karlsruhe Symposium, Organisation for Economic Co-Operation and Development European Nuclear Energy Agency, 1961	24	24
UN/IAEA	1962	Panel on Light Water Lattices, Vienna, Austria, May 1962	21	21
UN/IAEA	1963	Panel on Heavy Water Lattices, Vienna, Austria, February 1963	42	42
UN/IAEA	1963	Symposium on Exponential and Critical Experiments Held by the International Atomic Energy Agency in Amsterdam, Netherlands, 2-6 September 1963	7	7
UN/IAEA	1964	Third United Nations International Conference on the Peaceful Uses of Atomic Energy, Geneva, Switzerland, 31 August-9 September 1964	14	5
UN/IAEA	1965	Symposium on Criticality Control of Fissile Materials Held by the International Atomic Energy Agency at Stockholm, 1-5 November 1965	46	46
UN/IAEA	1968	Symposium on Fast Reactor Physics and Related Safety Problems, Karlsruhe, Germany, 1968	8	2
Other	1959	Eleventh Symposium in Applied Mathematics of the American Mathematical Society, New York, New York, April 23-25, 1959 (A Symposium on Nuclear Reactor Theory)	19	19
Other	1966	International Conference on Fast Critical Experiments and their Analysis, 10-13 October 1966, Argonne, Illinois	40	40
Other	1968	Livermore Array Symposium 23-25 September, 1968	18	18
Other	1972	National Topical Meeting on New Developments in Reactor Physics and Shielding, Kiamesha Lake, New York, Sept. 12-15, 1972	48	0
Other	1973	Nuclear Criticality Safety Short Course, D. H. Lawrence Ranch, Taos, New Mexico, 7-11 May 1973	19	19
Other	1976	Symposium on Reactor Physics, Bombay, India, 1 March 1976	13	13
Other	1979	Seminar on Safety-Criticality, Valduc, France, 16 October 1979	23	23
		Totals	1766	2471

THE DYER-THOMAS COLLECTION

In 2008 staff members at ORNL sent us two Excel files that contain bibliographic data for document collections that were left upon the retirements of Joe Thomas and Howard Dyer. We merged the two files into a new file which now contains 1471 records. Many of the documents were already present in the NCSP bibliography but we found 672 that were not present and added them to the NCSP bibliography. An improved and expanded file was later returned to Oak Ridge. We had improved the collections by converting the data fields to internally-consistent standard formats and added abstracts and conference information that were available in the NCSP database. We estimate that there are about 1000 documents in the Dyer-Thomas collection that are not available in our hardcopy files that can be scanned and made available via the NCSP web bibliography.

LOSS OF THE ROCKY FLATS COLLECTION

We mentioned earlier in this paper that a scanned document collection is a means of ensuring that important documents are not lost due to dispersal, degradation, or to physical destruction. An example of such loss might be that which took place upon the closing of the Rocky Flats facility. Rocky Flats had assembled a substantial collection of criticality safety documents. Dr. Rothe (Reference 1) has noted that he retains a few of the less-well-distributed internal documents in his personal collection. Many of the others evidently have been destroyed or dispersed and are now unavailable to be scanned. We hope, however, that the NCSP files and the Dyer-Thomas collection retain a good percentage of the Rocky Flats collection.

CONCLUSION

Staff members in the LLNL Nuclear *approximately* Criticality Safety Division have found the collection of criticality documents very helpful in their work. Some of the LLNL work supported other NCSP activities such as criticality safety training and evaluations for the NCSP International Handbook of Evaluated Criticality Safety Benchmark Experiments. While preparing this manuscript for this conference the authors have observed personally the utility of the resource: We wished to retrieve the remarks that Dr. Rothe had written about the near-catastrophic loss of the archival records at LANL. We used the NCSP database to find the document record and its link to the full-text version on the internet. The document (reference 1) was downloaded and the information was found. This was all accomplished in minutes. Our work to preserve and disseminate the hardcopy documents will enable others to accomplish similar tasks with minimal effort.

This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.

REFERENCE

¹ROBERT E. ROTHE, "A Technically Useful History of the Critical Mass Laboratory at Rocky Flats," LA-UR-05-3247, May, 2005