# References for Therac-25 Case

**Year**

2003

**Description**

In addition to an attempt at a comprehensive bibliography, the authors have included annotations to those references that they think would be the most useful to students of this case.

**Body**

1. N. Leveson, C. Turner, "An Investigation of the Therac-25 Accidents," In Ethics and Computing: Living Responsibly in a Computerized World, by K. W. Bowyer. Los Alamitos, CA: IEEE Computer Society Press, 1996. First Published in Computer, Vol. 26. No. 7, July 1993, pp. 18-41.

> The classical report on the Therac 25 system from someone who was involved in the cases as an expert witness. Some portions of this article are provided in the resources sections of this case. This piece is packed with detail and will take some time for even a careful reader to fully grasp. This reprint of the article is in an excellent volume that contains many other cases that computer science instructors will find helpful.

2. N. G. Leveson. Safeware: System Safety and Computers. Reading: Addison-Wesley Publishing Company, 1995

> An excellent source on software systems and their role in the safety of larger industrial and military systems. This large text pays dividends to the extent that one reads closely. Instructors who want to teach the Therac 25 system

from a safety perspective will be well served if they have recourse to this volume.

3. E.J. Joyce, "Malfunction 54: Unraveling Deadly Medical Mystery of Computerized Accelerator Gone Awry," American Medical News, Oct. 3, 1986, pp. 1,13-17

An accessible and journalistic approach to the Therac case. Has pictures of the people involved in the case and of the machine. This is part of a series of articles in Amercan Medical News that is quite helpful.

4. J. Reason, Human Error. Cambridge: Cambridge University Press, 1990.

Reason is an expert on human-machine interactions. His book contains excellent analyses of system safety, and many detailed studies of system accidents, with references. His analysis of how systems should be built to take advantage of human abilities (rather that to emphasize their shortcoming) is well worth the price of the book.

5. C. Perrow. Normal Accidents: Living with High-Risk Technologies. Princeton, NJ: Princeton University Press, 1984.

A classic text in system safety. Perrow's argument is that technological systems are becoming so complex to build and maintain that catastrophic accidents will become normal.

6. C. W. Huff, "Unintentional power in the design of computing systems." In T .W Bynam & S. Rogerson (Eds.) Computer ethics and professional responsibility, (p. 98-106). London: Basil Blackwell, 2004, p. 98-106.

An analysis of the often undesired power that software engineers hold over those who use systems they design. The article uses Therac-25 as an example..

7. C. W. Huff, & R. Brown. "Integrating ethics into a computing curriculum: A case study of the Therac-25." In A. Akera & W. Aspray (Eds.), Using history to teach computer science and related disciplines. Washington DC: Computing Research Association. 2004, pp. 255-277. (pdf available)

An analysis of the Therac-25 case that tries to set the race condition erros in the context of the computing knowledge of the time. It concludes that so little was known about race conditions in software at the time that responsibility for

them is unclear. Still, there are many other ways AECL could have avoided the problems, even in the presence of race conditions.

## Additional Therac Sources

C.A. Bowsher, "Medical Devices: The Public Health at Risk," US Gov't General Accounting Office Report GAO/T-PEMD-90-2. 046987/139922, November 6, 1989.

E. Chelimsky, "Medical Devices: Early Warning of Problems is Hampered by Severe Underreporting," GAO/PEMD-87-1, December, 1986.

J. Jacky, "Safety-Critical Computing: Hazards, Practices, Standards, and Regulation." In Computerization and controversy: Value Conflicts and Social Choices, edited by C. Dunlop and R. King. San Diego: Academic Press, Inc., 1991. First published in The Sciences, September/ October, 1989.

E.J. Joyce, "Accelerator Linked to 5th Radiation Overdose," American Medical News, Feb. 6, 1987, pp. 1,49-50.

E.J. Joyce, "Software 'Bug' Discovered in Second Linear Accelerator," American Medical News, Nov. 7, 1986, pp.20-21.

M. Kivel, "FDA Monitoring Correction of Therac Radiation Therapy Units," Radiological Health Bulletin, Vol.XX, No. 8, Jan. 7, 1987, pp. 1-2.

M. Kivel, "Therac-25 Accelerator Purchasers Advised to Discontinue Routine Use," Radiological Health Bulletin, Vol. XXI, No. 3, March 1987, pp. 1-2.

D. Lacasse, "Kanata Firm Works to Prevent Repeat Errors; Complexity of Software Used in 'Safety-Critical' Environments Makes It Impossible to Ensure Absolute Reliability," The Ottowa Citizen, Final Edition, Sept. 15, 1991, p. E6.

E. Miller, "The Therac-25 Experience," Proc. Eighteenth Annual National Conf. on Radiation Control, Jan. 1987, pp. 101-105.

R. Pear, "Group Asking U.S. for New Vigilance in Patient Safety," New York Times, Nov. 30, 1999. W.

Plummer, "A Computer Glitch Turns Miracle Machine into Monster for Three Cancer Patients," People Weekly, Vol. 26, Nov. 24, 1986, pp. 48-51.

J.A. Rawlinson. "Report on the Therac-25," OCTRF/OCI Physicists Meeting, Kingston, Ont., Canada, May 7, 1987.

B. Steinhardt, "Medical Devices: FDA Can Improve Oversight of Tracking and Recall Systems," GAO/HEHS-98-211, September, 1998.

R.C. Thompson, "Faulty Therapy Machines Cause Radiation Overdoses," FDA Consumer, Vol. 21, No.10, Dec-Jan. 1987, p.37-38.

## Resource Type

Bibliography

## Parent Collection

Therac-25

## Topics

Catastrophes, Hazards, Disasters
Ethics and Society
Public Health and Safety
Research and Practice
Safety