Acknowledgements

• To my guide Dr. T. Jayakumar (Director, MMG, IGCAR) and my co-guide Dr. Keshava Murthy (Head, RSDD, IGCAR) for being my source of guidance.

• To my other doctoral committee members: Dr. M. Sai Baba (Associate Director, RMG, IGCAR) (who also acted as my troubleshooter) and Dr. S. Venugopal (Associate Director, GRIP, IGCAR) for their guidance and mentoring.

• To Dr. P. Swaminathan (Former Group Director, EIG, IGCAR), for introducing and motivating me to take up the research topic.

• To N. Murali (Associate Director, ICG, EIRSG, IGCAR) for being my friendly technical advisor. His strong opinions, questions, and suggestions have significantly improved my work.

• To Dr. C. Senthil Kumar (Scientific Officer/G, Safety Research Institute, AERB) for being my collaborator. I am lucky to have worked with him, and I cannot thank him enough for his patience during discussions and reviews.

• This thesis is case study centric, and cannot be completed without the help of engineers (at EIRSG) associated with the systems, who have patiently helped me in understanding the safety systems. I would like to thank Anindya Bhattacharyya, A. Santhana Raj, M. Chandramouli Sharma (also my labmate), M. Manimaran, Manoj, MA. Sanjith, and Saritha Menon.

• Special thanks to S.A.V Satyamurthy (Group Director, EIRSG), R. Jehadeesan (Computer Division), and staff members for providing me the high performance computing facility, which has led to quicker results.
• To A. Shanmugam, Aditya Gour, Alok Gupta, B. Sasidhar Rao, D. Thirugnanamurthy, L. Srivani, M. Kasinathan, P. Parimalam, Patankar, R. P. Behra, Venkat Kishore, and other EIRSG staff members for all the encouragement, discussions, suggestions, and assistance.

• To the administrative staff of EIRSG for timely assistance.

• I am truly indebted to the contributors of free and open source software such as: \LaTeX, OpenBSD, Vim, GCC, Erlang, Drakon, Python, Gnuplot, Graphviz, Linux, etc. which have made my work easier.

• Many thanks to Dr. Baldev Raj (Former Director, IGCAR), Brad Stewart (Developer Geeks), Prof. Dick Hamlet (Portland State University), and S. Kishore (FRTG, IGCAR) for allowing me to use their published materials in my thesis.

• To the reviewers and editors of journals, conferences, and symposiums for reviewing my work.

• To my dear parents and friends: Anil, Ashutosh, Biju, Bubathi, Deepak, Govindha, Hari Babu, Hemangi, Naveen, Paawan (also my labmate), Rajini, Ravikirna, Saptarishi, Sharath, Srihari, Subhra, and others for all the fun times we had and for just being there for me.

• To the Department of Atomic Energy (DAE) for providing me the generous DAE Graduate Fellowship Scheme (DGFS) Ph.D fellowship.

P. Arun Babu