



# **Rocket Science**

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## Dedication and Foreword

This text is the second in a series to touch the area of rocketry. And it follows the many National Association of Rocketry and Tripoli Rocketry Association works I have prepared. It is up to you the reader to judge if it is worthy of your bookshelves. It is also meant to educate and enlighten the rocketeers, engineers and scientists growing up today and who are seeking the vast knowledge that resides in Aerospace Engineering and space flight.

Simply, you can become a rocket scientist using this book and a few other outstanding resources. This document will serve students, High Power and Model Rocketry designers and the hobbyist. It is also for those great teachers seeking to inspire students to be creative and learn in the sciences. If you have a handle on algebra and some physics, this text will take you the rest of the way. For teachers this book will demonstrate fundamentals your students will see again in college in their first two years of Engineering. And an early head start on those engineering fundamentals places you in the front of your class I might add. With a 31 year career in nuclear engineering, I have enjoyed and at times suffered from the hand of my instructors, I hope to put some of that experience in your hands as you read and apply this book.

Rocketry is not as difficult as the public would seem to think. "Gee that's rocket science" kind of comments always make me chuckle, because I am a rocket scientist. If you are reading this, then you fall in that category of either being one or have that wonderful desire to become one. This book will support and aid you for years to come. We have a great trip to take in these pages and the methods apply all the way from model rocketry to the Space Shuttle.

In terms of dedication, I thank my best friend for keeping me on the path of space and rocketry. I am truly never happier than holding that launch controller and hearing the countdown. As my High School teacher who took an average student and gave him the thirst for science, Arne you gave my life a great send off.

I owe a deep debt from the following men in providing me the best hobby and fun I have every known. Harry Stine created model rocketry along with Orville Carlisle and Vern Estes in the late 1950's. Some 46 years later, I was honored to be the engineering keynote speaker at the School of Aerospace Engineering at the University of Illinois talking on model and high power rocketry and how it has and will educate our young men and women.

I drove home after that night, with a few tears thinking, my God, I just got a standing ovation from 75 to 100 of the best minds in this country, God Bless Harry Stine ! You see, U of I was were I wanted to get my degree from, so being in front of that group was a real treat. Now I would like to give back to the students, teachers and rocketeers old and new. All within this textbook are the tools you can use today. Be your interest in propulsion, telemetry, computer programs, CAD or the like, we will go to all these places.

If you are a student trying to get a handle on aerodynamics, flight mechanics, electronics, stability and structures in rocketry design, this book will serve your needs and give you a foundation to build on. This is more than a hobby text that shows how to construct model and high power rockets, its the fundamentals that stand behind the craft as well.

A deep thanks to the dedicated staff at NASA. The many diagrams, images and programs shown, demonstrated and discussed here come from many years of research at NASA centers. The efforts of the NASA team is appreciated by the membership of both the NAR and TRA. To the membership of both the TRA and NAR, I sincerely hope this text will be an aid in your design efforts not only today but tomorrow.

Finally to Gordon Mandell, George Caporaso and Bill Bengen the writers of "Advanced Topics in Model Rocketry my deepest thanks for making the first book of rocket engineering in 1973. Your exceptional text and efforts are still noteworthy in 2009.

We are on the frontier, and each day is a new discovery!

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