

**Mechanical Design of Telescopes
for the Amateur
by Bob Lombardi**

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The Story of this Book

I began this book in about 1990 as a collection of notes that I was writing for myself on the design considerations I should keep track of when building a lightweight, portable telescope. I had noticed that there were several books on building a telescope aimed at helping you produce your first scope, but there was a shortage of material on building your second or third telescope, especially if you wanted it to be a higher-performance design. There was no single place to find all of the mechanical engineering aspects involved in telescope design.

As an engineer, there have been many times both in school and in the real world where nature proved my intuition wrong, and showed my “gut feelings” to be so much gas. I was determined to try to build a better scope by following solid, real-world, mechanical engineering principles and methods. There is much folklore bandied about by builders: things that generally work, things that only work in special cases, and things that are not true at all. You’ll find designs copied without considering things like scaling of part sizes for the different forces involved. You’ll also find very clever designs that are based on a great intuitive feel for the way things ought to work. I was determined to follow the same methods in telescope design as I follow in my career in electronics: understand the theory and be able to predict how the telescope will behave before you build it.

When the opportunity arose to write this book, I realized that there was a big hurdle in front of me: math. Many people are terrified of math, even if you show them a set of steps to perform on a calculator and list the keystrokes to follow. I was determined that all of the math that might be performed by calculator operations should be available to the extremely math-phobic, and decided to write a companion software program to the book to do the tedious hand calculator math for you. I tried to make it accessible to anyone with simple forms for entering numbers, and buttons to push to get your answers. Another aspect of “the math problem” can be seen by looking at the average, poorly-written textbook (unfortunately, the average textbook is poorly written). It’s an old saying that textbooks are written to impress teachers, not to teach students. Far too often, math is used instead of good descriptions. My answer was to attempt to write the book in such a way that the math helps to describe what happens, but isn’t the only description. To put it another way, English should be the primary language of the book, not math. I firmly believe that any concept, no matter how obtuse, can be explained in English without resorting to math.

The original software was written in Borland’s Turbo Pascal to run under MSDOS. I had been writing in DOS Turbo Pascal for five years when I started this program, and had produced software that had been used professionally. When the Windows revolution passed, I found myself needing to re-write the telescope design software so that users could have a graphical user interface.

While this was a lot of work, the end result is software that is more usable and more user-friendly. The built-in help system in Windows is much bigger and better than anything I wrote for the MSDOS users. In addition, the software is easier to use and more forgiving of user errors.

What you see before you is a one-man project. I wrote the text you'll read, I drew the (admittedly, crude) drawings in CAD programs, and I wrote the companion software. As I like to say in my "day job", if you find a problem: it's all my fault. Naturally before it gets to a point like this, I've read and re-read the individual sections hundreds of times. But I'm sure there are still some goofs in there. Part of the "due diligence" you should put into any design is trying to make sure it will work before you build something.

Although this is a one-man effort, I did ask experts in the field to review my work. Hearty thanks to Mel Bartels, Mark Holm, and Bob May (in alphabetical order) for their reading and comments. If any mistakes remain, they are mine alone.

I hope you enjoy this book, and I hope it improves your telescopes. The telescope making community is not very large, and the very hobby we share tends to keep us somewhat isolated. It's my pleasure to give back to our hobby and the people who have given so much to me, in whatever small way I can.

Dedication:

To my wife, Pam, in the hope that I'll someday be the things she thinks I already am.