

A long time ago in a country far, far away  
a few of us had a vision....  
to provide Astronautics for Anyone!

That vision became...



# UNDERSTANDING SPACE

An Introduction to Astronautics

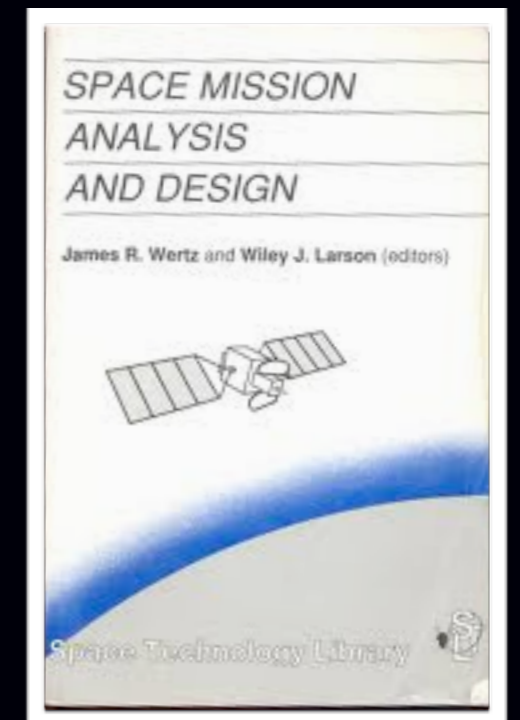
this is the story of the past, present and future  
of that bold endeavor

# It all started in 1991...

USAFA, Colorado Springs, CO USA



- Gen. Bob Giffen, Head of the Dept of Astronautics at USAF Academy suggested an introductory book to SMAD was needed
- Dr. Wiley Larson stepped up as editor, along with Doug Kirkpatrick
- I raised my hand to volunteer
- The rest is history...



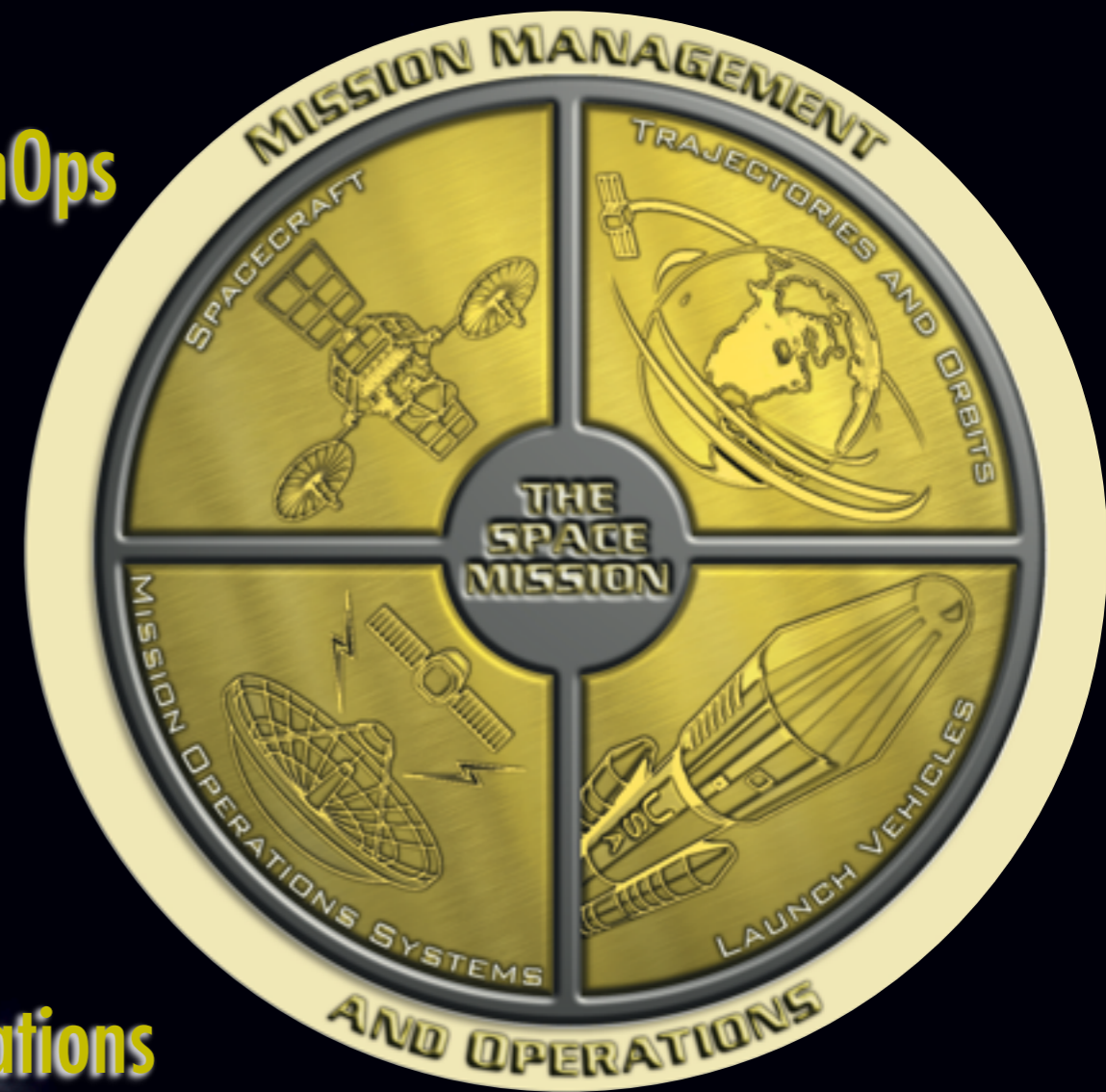
# The Vision...

- **Astronautics for Anyone**
  - **Introductory text at the undergraduate level**
  - **Cover A to Z of space missions with roughly equal breadth and depth**



# The Approach...

- **The Space Mission Architecture**
  - **The Mission - need, goals, ConOps**
  - **Trajectories and Orbits**
  - **Spacecraft**
  - **Launch Vehicles**
  - **Mission Operations Systems**
  - **Mission Management & Operations**



# The first draft...1992

- Rough, black and white edition
- Used by cadets in core astro classes at USAFA
- Great feedback



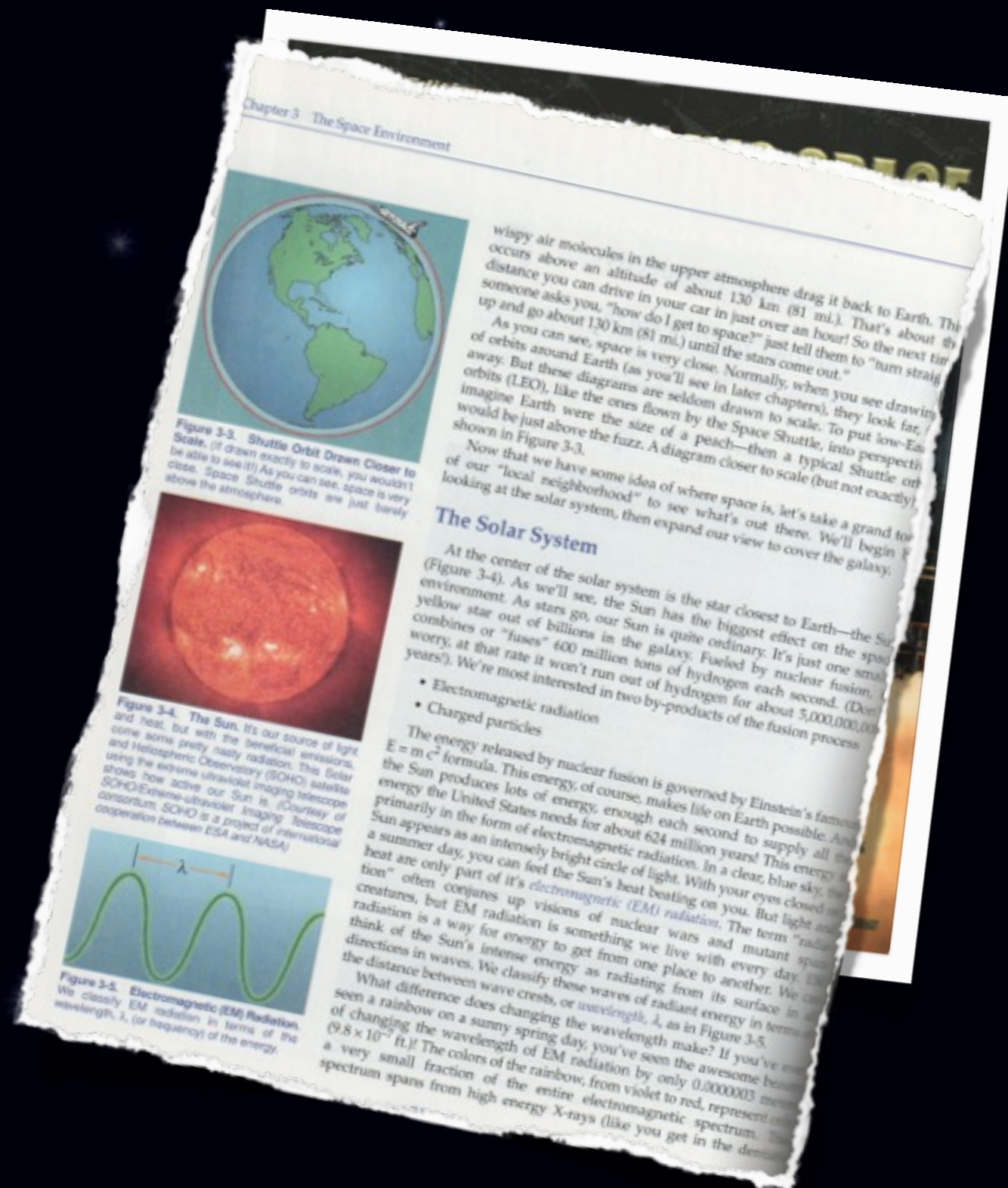
# The first edition...1993

- 3-color (red, blue, black)
- Widely published by McGraw-Hill
- Used by thousands of students around the US



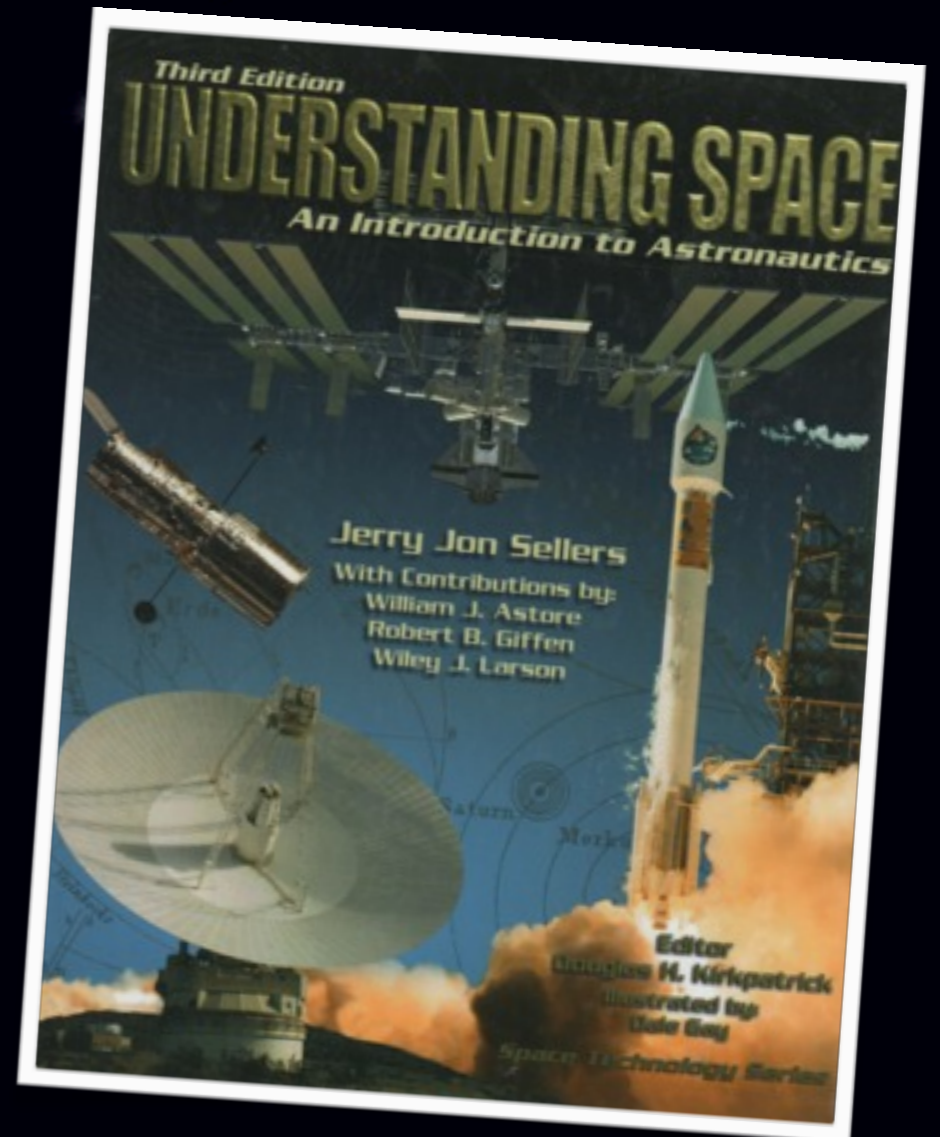
# The second edition...2000

- Full color
- Expanded space systems sections
- Used by thousands more students around the US and world



# The third edition...2004

- Full color
- Complete update and corrections
- Expanded propulsion and systems engineering discussion

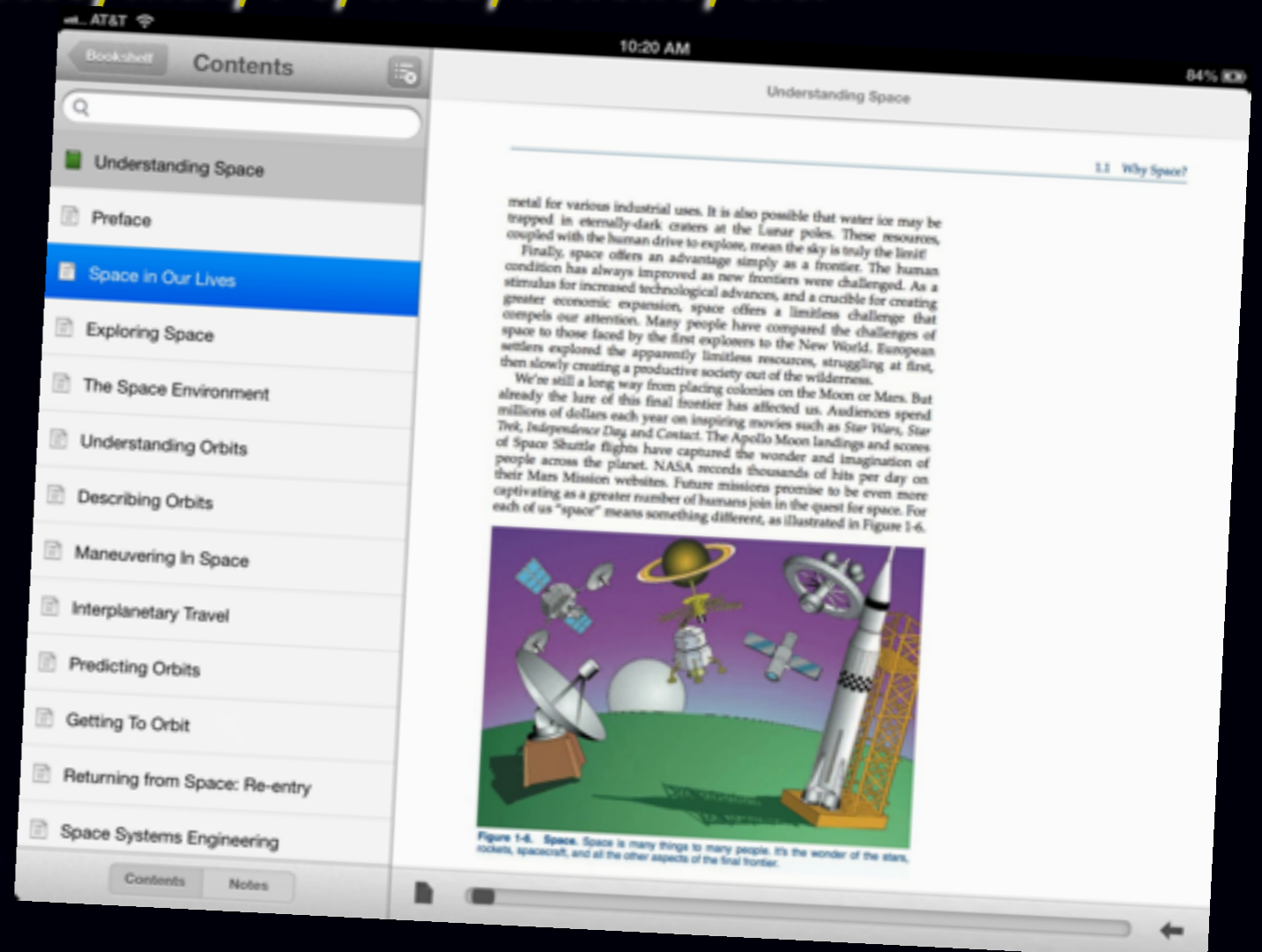




# eBook...

- Take Understanding Space anywhere!
- Full searchable text available as e-book from McGraw-Hill Create
- Can run on up to 3 devices, Mac, PC, iPad, iPhone, etc.

iPad e-book  
screenshot



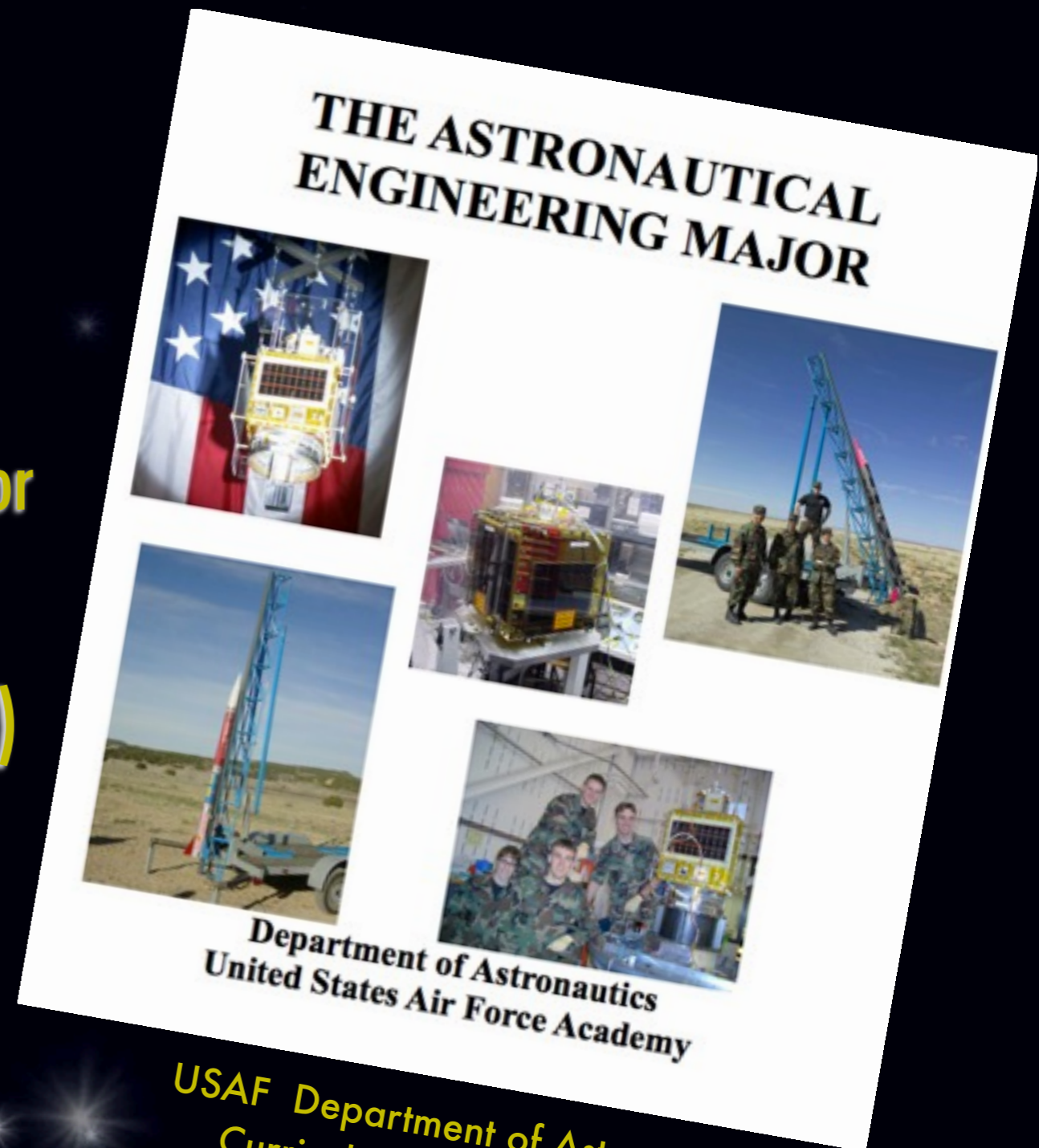
# In the Classroom...Around the World

- Undergraduate
- Graduate



# Foundation for a complete curriculum...

- Example: Undergraduate Astronautical Engineering major at USAF Academy
- Oldest @ 50 ys, (and only?) astronautics only major in the US (world?)



USAF Department of Astronautics  
Curriculum Handbook 2012

# Goals of USAFA Astro Curriculum...

*Program Curricular Outcomes* are listed below. Upon successful completion of the Academy program in Astronautical Engineering, cadets will have the ability to:

- Use fundamental knowledge of orbital mechanics, space environment, attitude dynamics and control, telecommunications, space structures, and rocket propulsion to solve astronautical engineering problems, including engineering design,
- Plan and execute experimental studies and formulate sound conclusions, analyzing empirical data ,
- Apply modern technology tools to solve astronautical engineering problems,
- Communicate effectively using oral, written, graphical and electronic format,
- Recognize the ethical and professional responsibilities of Air Force Officership and the engineering profession,
- Work effectively as a member of a multi-disciplinary design team,
- Recognize the benefits of and possess skills needed to engage in life-long learning, and
- Informatively discuss the impact of engineering on present-day societal and global contemporary issues to include Air Force aerospace capabilities and requirement

# USAFA Course Requirements...

USAF Department of  
Astronautics Curriculum  
Handbook 2012

## COURSE REQUIREMENTS: 148 Semester Hours

A. 97 Semester hours of Dean's academic core courses to include:

- Aero Engr 241 - Aero-Thermodynamics
- Astro Engr 210 - Introduction to Astronautics (Understanding Space!)
- Math 356 - Probability and Statistics for Engineers and Scientists
- ECE 231 - Electrical Circuits and Systems I
- Astro Engr 437 - Small Spacecraft Engineering II

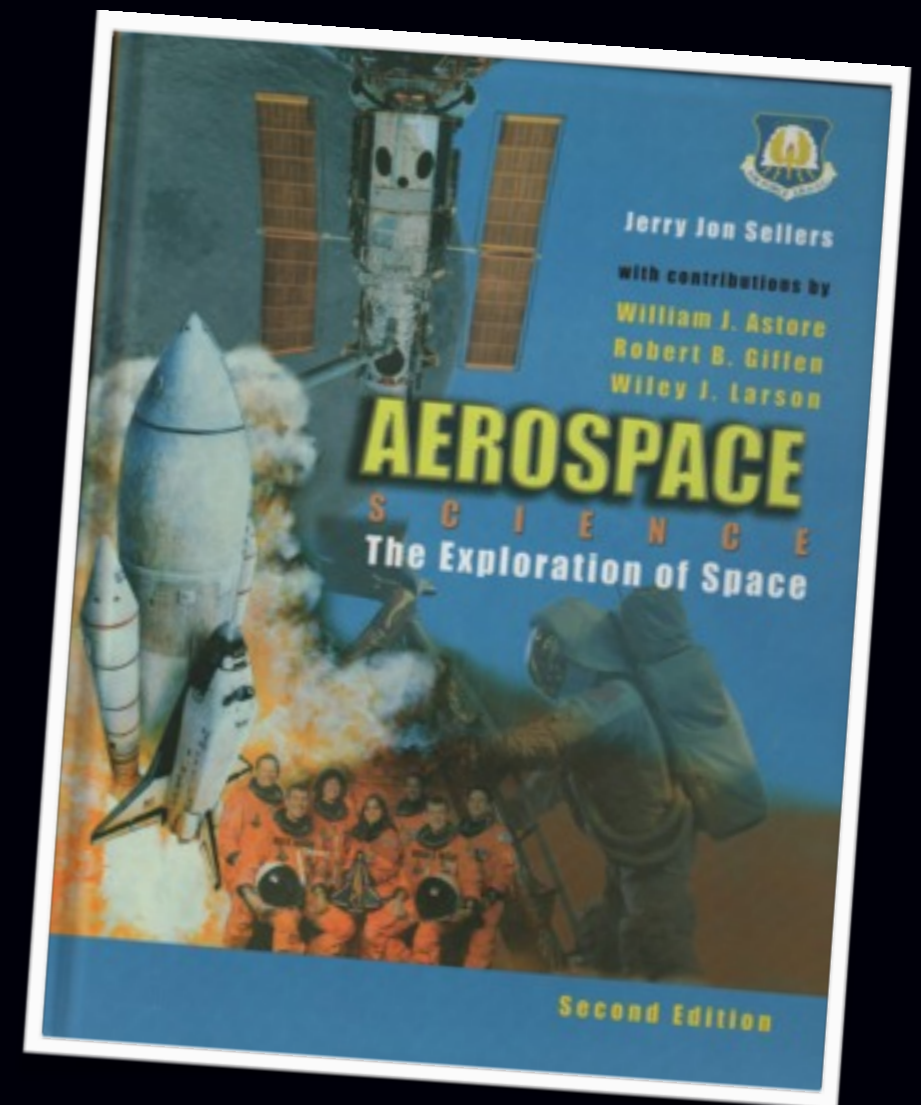
B. 3 Semester hours of Academy Option, e.g. Astro Engr 423 Space Mission Design

C. 43 Semester hours of major's courses:

- |                           |  |
|---------------------------|--|
| 1. Math 243 (or Math 253) | Calculus III (or Advanced Placed Calculus III) |
| 2. Math 245               | Differential Equations                         |
| 3. Math 346               | Engineering Math                               |
| 4. Engr Mech 320          | Dynamics                                       |
| 5. Engr Mech 330          | Mechanics of Deformable Bodies                 |
| 6. Engr 341               | Linear Systems Analysis and Design             |
| 7. Engr 342               | Linear Control System Analysis and Design      |
| 8. Astro Engr 201         | Technology Skills for Astronautics             |
| 9. Astro Engr 321         | Intermediate Astrodynamics                     |
| 10. Astro Engr 331        | Space Systems Engineering                      |
| 11. Astro Engr 351        | Rocket Propulsion                              |
| 12. ECE 446               | Applied Communications                         |
| 13. Astro Engr 445        | Spacecraft Attitude Dynamics and Control       |
| 14. Physics 37            | Upper Atmospheric and Geo-Space Physics        |
| 15. Astro Engr 436 (F)    | Small Spacecraft Engineering I                 |

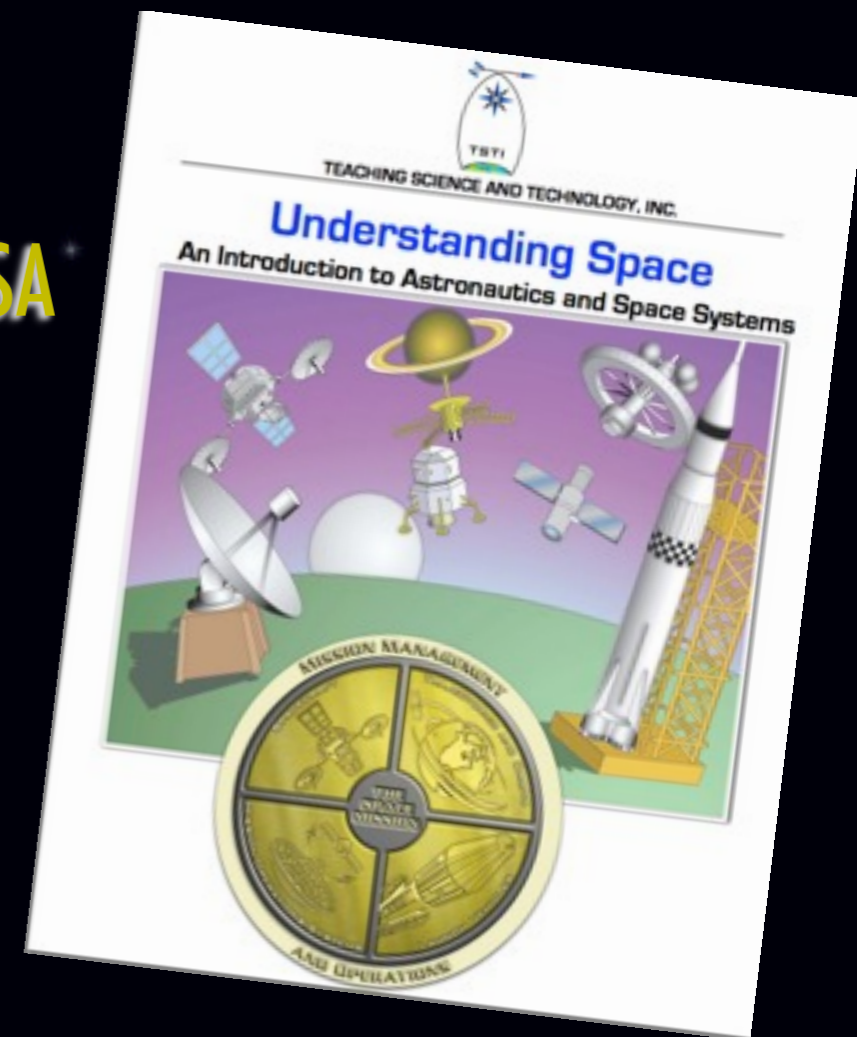
# High School, Middle Schools....

- Versions developed tailored especially for middle school (12-14 year olds) and high school (14-18 year olds)
- Includes:
  - Teacher notes
  - Student workbook



# Short Courses...

- Starting in 1996, Teaching Science & Technology Inc. (TSTI) began offering Understanding Space as a short course around the industry
- Now the basis for
  - NASA - Introduction to Aerospace @ NASA
  - Lockheed-Martin - New hire program
  - Numerous other organizations



# Impact...

- **University Students**
- **>30,000**
- **Short Courses**
- **>15,000 students and counting!**
- **But that's not enough!**





# Now...Online...

- Launched in 2012
- Official online training for USAF Space & Missile Center
- Available to Anyone today
- Learn
- Explore
- Do
- Show You Know

**UNDERSTANDING SPACE**  
An Introduction to Astronautics and Space Systems  
An integrated online learning experience

Course Home Using Space Orbits and Trajectories Space Systems Instructor Q&A

TSTI > Online Courses > US-Online

**EXPLORE**

- Explore: Early Space Pioneers
- Explore: Mission Profile - GPS
- Explore: Space Operations
- Space Glossary
- PreSAT Mission Design Notebook

**Using Space**

**LEARN**

- Lesson 1.1 - Space in Our Lives
- Lesson 1.2 - Elements of a Space Mission
- Lesson 1.3 - A Brief History of Space
- Lesson 1.4 - The Space Enterprise
- Lesson 1.5 - Space Systems Engineering
- Lesson 1.6 - Mission Management
- Lesson 1.7 - Space Operations
- Lesson 1.8 - Down to Earth Issues

**SHOW YOU KNOW**

- Using Space Study Guide
- Quiz: Using Space

**DO**

- Do 1: Course Project ROI
- Do 2: Define Mission Needs Goals and Objectives (NGOs)
- Do 3: Develop a ConOps
- Do 4: Develop a Program Plan

Announcements

Previous announcements  
No announcement has been posted.  
[Add new announcement...](#)

Calendar

September 2012

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

Events Key

- Global
- Course
- Group
- User

Administration

- Grades
- Profile

AGI

TSTI is a proud academic partner with AGI, makers of Satellite Tool Kit (STK)



Welcome to...



Since the dawn of the Space Age just five decades ago, we have come to rely more and more on space for a variety of earthly needs. Daily weather forecasts, instantaneous world-wide communication and navigation, as well as the ability to keep an eye on not-so-friendly neighbors, are all examples of space capabilities that we've come to take for granted.

This course is designed to make you "space smart," by building your understanding and appreciation for the complex requirements of space missions. This course will help you....

- Gain core Space Knowledge
- Comprehend space mission capabilities, trade-offs and limitations
- Apply space concepts to real-world problems
- Analyze typical space problems
- Synthesize concepts to design a space mission
- Evaluate basic technical and programmatic space issues

Getting Started

Your space adventure starts here...

Step 1:

**Read** through the **Course Handbook** and watch the introductory videos

- Course Handbook

Step 2:

**Complete** the Initial Personal Study Plan Questionnaire

- Initial Personal Study Plan

Step 3:

**Take** the Pre-course quiz (no need to study! just take to see where you're starting from!)

- Pre-Quiz

Step 4:

**Create** your student profile (click on "profile" under the Administration block on the left).

Step 5:

**Access** your Understanding Space e-Book using the access code provided by your course mentor. Read and follow the e-Book access instructions by clicking the link below.

- e-book Access Instructions

Finishing Up

- Online Course Survey
- Post-Quiz
- Final Personal Study Plan

Activities

- Assessments
- Assignments
- Books
- Custom Certificates
- Forums
- Glossaries
- Lessons
- Questionnaires
- Quizzes
- Resources

People

- Participants

The course reference:

**UNDERSTANDING SPACE**  
An Introduction to Astronautics

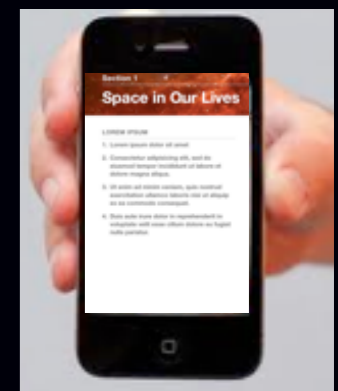
3rd Edition  
by Jerry Jan Sellers, et al., published by McGraw-Hill



Available as an e-book (access code required).

# The future?...in your hands?

- Branded Understanding Space-based online courses
- JAXA? UN? CNES? UK Space Agency?
- Understanding Space-lite free online course?
- Understanding Space App?
- Understanding Space iBook?



# Questions...?

about past, present or future episodes

