



Naval Science 4

College and Career Ready, Finances, Leadership, Cyber Technology, and Space Exploration for the NJROTC Student

1st Edition



Naval Science 4: You and the Future

College and Career Ready,
Finances, Leadership, Cyber
Technology, and Space Exploration
for the NJROTC Student

First Edition

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Prepare for Your Future

Unit 1

College And Career Ready

11

Chapter 1	Pathways to Your Future	12
	Trade Schools and Certification Programs	13
	Two-Year Degrees and Community College	14
	Four-Year Degrees at Public and Private Colleges and Universities	15
	Dual Enrollment and College Credit	16
	Military: ROTC, Service Academies, Enlistment	17
	Government Volunteering Opportunities	19
	Continuing Education	20
	Roads to Citizenship and Naturalization	20
Chapter 2	Setting a Foundation and Planning Ahead	22
	Self-Reflection	23
	Career Considerations	24
	Career Spotlight	25
	Strength, Aptitudes, and Interests	26
	Course Selection: Requirements and Resources	26
	Goal Setting	27
Chapter 3	Researching Colleges, Trade Schools, and Careers	29
	College Search and Building a List	30
	College Visits	32
	Career Exploration	33
	Know Your Resources	34
	How to Interview for a Job, College, or Scholarship	34
Chapter 4	Applying to Trade School or College	38
	Trade School Admission	39
	Community College Admission	39
	Four-Year College and University Admission	40
	College and Trade School Costs and Affordability	45
	Need-Based Financial Aid	46
	Merit Aid and Scholarships	48
	Student Loans and Debt	50

Chapter 5	Making a Decision	54
	Awaiting Outcomes: Admit, Deny, Defer, Waitlist	55
	Weighing Your Options	56
	Choosing a College or Trade School	56
	Return on Investment	59
	Comparing Financial Aid Packages	60
Chapter 6	Developing Current Skills	62
	21st Century Skills: What Are They and Why They Matter	63
	Hard Versus Soft Skills	63
	S.T.E.M Skills and the Future	64
	Skills of a Successful Student and Team Member	65

Unit 2	Personal Finances	69
---------------	--------------------------	-----------

Chapter 1	Making Dollars and Sense	70
	Saving vs. Investing	71
	Becoming a Saver	71
	Where to Save	73
	Saving for a Rainy Day (Emergency Fund)	74
	Creating a Monthly Budget	74
	Using Your Checking Account	77
Chapter 2	Investing for Your Future	81
	When to Invest	82
	Understanding Return	82
	Understanding Risk	82
	Investment Vehicles	83
	Basic Investment Strategies	84
	Understanding Interest Earned	85
Chapter 3	Your First Big-ticket Purchase	88
	Making Major Purchases	89
	Understanding Loans	89
	Buying a Vehicle	90
	Buying a House	94

Chapter 4	Give Yourself Some Credit	101
	Understanding Credit	102
	Managing Credit Cards	105
	Understanding Debt	108
Chapter 5	From Pay to Tax Payment	113
	Internal Revenue Service (IRS) Form W-4	114
	The Paycheck and Pay Stub	115
	IRS Form W-2 and Other Information	116
	IRS Form 1040	118
Chapter 6	Insuring Your Family	122
	Understanding Insurance	123
	Life Insurance	125
	Property Insurance	127
	Auto Insurance	129
	Health Insurance	131
	Disability Insurance	134
Chapter 7	Financial Planning	137
	Financial Planning	138
	Retirement Planning	139
	Types of Retirement Accounts	139
	Blended Retirement System	141

Unit 3	Leadership and Ethics	143
---------------	------------------------------	------------

Chapter 1	The Fundamental Principles of Leadership	144
	What Leadership Is and What It Isn't	145
	What Key Techniques or Skills a Leader Must Possess	146
	The Difference Between Being a Boss and Being a Leader	148
	Why Leadership is Important to All Organizations	154

Chapter 2	Essential Leadership Tenets	158
	Introduction	159
	Empower the People that Work for You	159
	Trust Your Team	159
	Be Honest and Direct with Your Team	160
	Do Not Tolerate Poor Performers	160
	Maintain Your Integrity and Honesty	161
	Be an Effective Communicator	162
	Be an Ardent Listener	162
	Be Decisive	163
	Career Spotlight	164
Chapter 3	Examples of Good and Poor Leadership	166
	How USS Santa Fe Went from Being the Worst Ship to the Best	167
	The Role Navy's Leadership Played in a Rash of Collisions at Sea	171
	A Shipboard Suicide and How It May Have Been Prevented	176
	How Leadership Led to the Discovery of a Weapon Onboard a Ship	178
	How Leadership Stopped the Physical Abuse of Shipmates	180
	An Example of Courageous Leadership by a Top Corporate Executive	181
	Reporting an Auto Accident in a Parking Garage	181
Chapter 4	Ethics as the Bedrock of Leadership	184
	Why Acting Ethical Is a Critical Component of Being an Effective Leader	185
	Building the "Ethical Muscle" to Do the Right Thing	188
	The Ethical Imperative for All Military Leaders	189
	Being Responsible for One's Actions 24 Hours/Day	192
Chapter 5	Case Studies in Ethics	195
	Introduction	196
	Rescuing Boat People at Sea	196
	Mỹ Lai and Hugh Thompson	198
	Video Harassment	200
	Cheating on High School Standardized Test Scores	200
	How a Strong Ethics Program Discovered a Murderer at the Naval Academy	201
	How a Leader Needs to Handle a Superior Who Isn't Following Guidance	203
	Story Telling... and When it's Time to Stop	204

Future Careers

Unit 4	Cyber Technology	207
Chapter 1	Nature of Cyberspace	208
	Private Networks, but Public Space	209
	Implications for Personal Cybersecurity	210
	Implications for National Security	210
Chapter 2	Threats in Cyberspace	213
	Range of Actors and Methods	214
	Concerns for Students	216
	Concerns for Schools and Communities	218
	Concerns for the Navy and the Country	220
Chapter 3	National Policies on Cybersecurity	226
	International Strategy	227
	Domestic Strategy	230
Chapter 4	Federal Roles and Missions	235
	White House	236
	National Cyber Director	237
	Department of Homeland Security	238
	Department of Justice	240
	Department of Defense	241
Chapter 5	The Navy and Cyberspace Operations	246
	U.S. Fleet Cyber Command/Tenth Fleet	247
	Training to Conduct Cyberspace Operations	251
	Satellites and Cyberspace Operations	253
Chapter 6	Careers in Cybersecurity	256
	Education Paths and Qualifications	257
	Public Sector and Military Opportunities	259
	Private Sector and Non-Profit Opportunities	262

Chapter 1	From Sea to Space	266
	Navy Firsts In Space	267
	Navy Astronauts Still Leading the Way	271
	Astronaut Training	271
	Spaceship Recovery	272
Chapter 2	Learning to Fly	274
	Rocketry Leads to Space Travel	275
	Aiming for Space	275
	An Artificial Moon	276
	The Mercury Program	277
	The Next Step: Gemini	279
	"Manned" Spaceflight?	280
Chapter 3	Onward to the Moon	283
	Project Apollo	284
	Skylab Space Station	285
	A Worldwide Endeavour	286
Chapter 4	Reusability and Living in Space The	290
	Era of Winged Spacecraft International	291
	Space Station (ISS)	292
	Old Space vs. New Space	294
	Space Tourism	296
Chapter 5	Back to the Moon, and Beyond	298
	Returning to the Moon	299
	NASA's Artemis Program	299
	Mission to Mars	300
	Living on Mars	301
	Finding an Earth 2.0	302
	NASA's Great Observatories	303

Chapter 6	A Threatening Space	306
	Risks to Human Body	307
	Van Allen Radiation Belts	307
	Starfish Prime	308
	Orbital Debris	308
	Solar Flares	309
	Asteroid Impacts	309
	Cosmic Killers	310
Chapter 7	Defending the Final Frontier	313
	Hypersonic Weapons	314
	Anti-satellite Weapons	315
	NORAD	315
	U.S. Space Force	316
	U.S. Space Command	317
Chapter 8	Benefiting All of Us	319
	Consumer Goods	320
	Energy and Environment	320
	Health and Medicine	321
	Industrial Productivity	322
	Information Technology	322
	Public Safety	323
	Transportation	323
Chapter 9	Careers in Space and Beyond	326
	Overview	327
	Education Paths and Qualifications Private	327
	Sector and Non-Profit Opportunities	329
Back matter	Bibliography	332
	Glossary	341
	Index	350



Unit 1

College And Career Ready

While high school is ideally a time of learning and growth, it is also preparation for the next step in life. This looks different for each person. It can sometimes seem complicated or overwhelming to consider what the future holds. But with some early planning and research, you can approach your post high school experience with balance and excitement. This unit will explore the many opportunities ahead and help you think about what might be best for you and your unique circumstances, interests, and hopes. While no textbook can make decisions for you, engaging with this information will help you plan thoughtfully and reach for your goals.

Chapter 1

Pathways to Your Future

What You Will Learn to Do

This chapter will introduce you to the many options that exist for learning and life beyond high school. It can feel like there is one set path as you plan for your next step. You might assume that you will go a certain direction or maybe there are specific expectations that dictate where you will go and what you will do. Work, college, military, service—maybe you have considered one or all these options for your future. Read on and learn about each one.

Skills and Knowledge You Will Gain Along the Way

- ✓ Define different types of degree and credential programs.
- ✓ Learn your options for education beyond high school.
- ✓ Explain military service opportunities.
- ✓ Become familiar with national volunteer programs.
- ✓ Understand the paths to citizenship.



Take the next step. Courtesy of iStock, Credit BrainAJackson

Trade Schools and Certification Programs

What is a trade school? If you are thinking that it is where you go to learn how to maximize the value of your baseball or Pokémon card collection, you have some work to do. *Trade schools*, also known as technical or vocational schools, are educational programs focused on building the skills and knowledge necessary to thrive in a specific industry or trade. Graduates of these schools commonly earn a certificate or diploma in that area of study rather than an associate's or bachelor's degree like two and four-year colleges. Trade credentials can lead to wide ranging careers, from a medical technician, welder, electrician, or plumber to becoming a chef, massage therapist, cosmetologist, and more. Some students start to master these skills in a Career and Technical Education (CTE) program while still in high school.



Some of the many trades you can pursue. Courtesy of iStock, Credit Yuri Arcurs

Common Questions

Is a trade school right for you, your interests, goals, strengths, and circumstances? Here are a few questions that students often wonder as they consider this option:

- **How long does it take?** Depending on the trade and industry, these programs can take anywhere from a few months to two years.
- **Is it difficult to be admitted?** Most trade schools and certificate programs are open enrollment, meaning as long as there is space in the class, you can register and work toward your credential.
- **What is student life like?** Trade schools do not typically have extracurricular programs or social activities for students since there isn't any residential housing.
- **How much does it cost?** Tuition prices vary depending on the length of the program, whether it is a private or public school or company offering the credential, and the type of degree/certification available. You could pay anywhere between \$4,000 and \$20,000 in total costs. Be sure to compare costs between different providers.
- **Is there financial aid for trade schools?** Most accredited trade schools offer financial aid through the federal government and use the same Free Application for Federal Student Aid (FAFSA) process as two- and four-year colleges. You will

learn more about FAFSA later in the unit. There are also scholarships available through public and private providers for specific trades.

Two-Year Degrees and Community College

New Vocabulary

associate's degree—
an undergraduate degree
awarded after two years
of study

Community colleges range in types of degrees and credentials offered. You might have heard them called two-year, junior, or technical colleges. However, depending on the school, they might have programs shorter than a year or as long as four years. They are called community colleges because they are usually partly funded by local and/or state government and serve students from the area in which they are located. Though some have residential housing available, most students live in the community and commute to class. Most community colleges offer two-year **associate's degrees** that provide a foundation in a specific subject and prepare students with skills and credentials to work in a job or to continue on to a bachelor's degree.



Community College. Courtesy of iStock, Credit Althom

Common Questions

Is a community college or two-year degree the right fit for you? Consider the following questions:

- **How long does it take to earn a degree?** While most associate's degrees require two years of full-time study, some students will fit their schooling around a full-time job, so it may take longer. Most community colleges also offer shorter certificate programs similar to trade schools.
- **Is it difficult to be admitted?** Like trade schools, community colleges are usually open enrollment, though there is often a more formal admission application process. Students should register early to be sure there is space, especially in popular majors and programs.
- **What is student life like?** Most community colleges have campus programs or activities for students. Some schools offer residential housing for students but also offer extracurricular opportunities for those who commute. Many community colleges also have competitive sports teams.

- **How much does it cost?** According to the Education Data Initiative, in 2021, the average cost of tuition and fees for community colleges was \$7,460 or \$1,865 for each semester. These costs vary widely based on the type of program, location, degree, and whether the institution is public or private.
- **Is there financial aid for community colleges?** Yes. Accredited community colleges offer need-based financial support through federal and local programs. Many also offer scholarship opportunities.

Four-Year Degrees at Public and Private Colleges and Universities

The traditional undergraduate college degree requires four years of study, though it could take as little as three years or as long as six or more years. Most colleges and universities offer **bachelor's degrees** in either Arts or Sciences and provide preparation for a range of different professional jobs. The difference between a college and university is that usually, but not always, a college is smaller, private, and focused on undergraduate education. Universities are generally larger and offer undergraduate and graduate degrees. There are definitely schools that differ from this model. Some public universities have **articulation agreements** or automatic transfer programs with local community colleges. These agreements allow you to earn an associate's degree at the community college and, if you maintain good grades, you will be guaranteed the ability to complete a bachelor's degree at the university.

New Vocabulary

bachelor's degree—
a four-year college degree

articulation agreement—
allows students to transfer to a four-year college/university after earning associate's degree



A college campus. Courtesy of iStock, Credit F11photo

Common Questions

Are you ready for a college or university education? The following questions might help you decide:

- **How long does it take to earn a degree?** Usually between four and six years, depending on the program and whether you are a full-time or part-time student.

- **Is it difficult to be admitted?** The admission rates of colleges and universities vary greatly. Some colleges take 100 percent of the students that apply, and on the opposite end of the spectrum, the most selective schools accept only 5 percent or less of applicants. Most four-year schools accept over half of all applicants and the national average is nearly two-thirds of those who apply gain admission.
- **What is student life like?** Most four-year colleges and universities have residential housing and very active campus programs for students. This includes competitive and intramural sports, clubs, performing arts, and other organizations for students to get involved.
- **How much does it cost?** According to the Education Data Initiative, the average total cost of college (tuition, room and board, and other fees) In 2021 was \$35,720 per year. Like with community colleges, there is a huge range among four-year colleges and universities, depending on whether they are private or public, if the student lives in-state or out-of-state, and other factors.
- **Is there financial aid for four-year colleges and universities?** Yes. Accredited colleges and universities offer need-based financial support through federal and institutional grants and loans. Many also offer non-need-based scholarship aid. Nationally, 86 percent of all first-year college students receive some type of financial aid. We will cover this more in depth later in the unit.

Dual Enrollment and College Credit



Students can sometime enroll in classes for college credit while in high school. Courtesy of iStock, Credit PeterPencil

Dual enrollment refers to courses that students take during high school and earn college credit. Often these classes are taken in partnership with a local community college, though there is also a growing number of online programs that offer similar courses. Sometimes the students take these classes on the college campus with college professors while other classes are taught at the high school but are certified to earn college credit. Dual enrollment allows high school students to get a jumpstart on a college degree and save money and time if they enroll in college after graduation. Depending on the school, these opportunities might be limited to 11th and 12th graders.

There are other ways to earn college credit while in high school. Some colleges will award credit to students who complete an Advanced Placement (AP) or International Baccalaureate (IB) class and score well on the exam. Many colleges also offer summer programs for high school students where they can earn college credit if successful. Some students in high school Career and Technical Education (CTE) programs can often earn credit toward associate's degrees or trade school.

Common Questions

Dual enrollment is not available at all high schools. If you do have access to these courses, you might wonder whether you should take advantage of them? The answers to these questions might help you decide:

- **Can I earn a college degree while in high school?** In some cases, you can earn an associate's degree while in high school if you take enough dual enrollment courses, but not a four-year bachelor's degree. You may, however, complete a semester or year of college credit toward a four-year degree to graduate early.
- **Do all colleges accept dual enrollment classes?** No. Some schools do not count dual enrollment credits toward earning your degree. If you are applying to college, check with each school to see if the credits will transfer.
- **Can anyone take dual enrollment courses?** Each high school has different policies. Sometimes you must maintain a certain grade point average to be able to enroll in these courses, or there may be other requirements.
- **Does it cost anything?** This depends on the state and school. In some states or districts, the costs for dual enrollment credit are paid for. In other schools, students must pay per credit to be able to transfer these toward a degree. Check with your counselor to understand your school's policy and any related costs.
- **Is it better to take dual enrollment or Advanced Placement (AP) or International Baccalaureate (IB) classes?** Like many other answers, it depends. Colleges and universities will look at these courses differently when considering you for admission. Because AP and IB classes are taught to a national standard, some colleges see these as more rigorous, while dual enrollment courses can vary in quality. Some high schools and colleges will also factor the weight of these courses into your grade point average in different ways, so be sure to ask about these policies.

Military: ROTC, Service Academies, Enlistment

If you are considering military service, there are several different paths you can take. Some students will enlist in one of the armed forces right out of high school. Others will apply to one of the service academies or military colleges. Students may also choose the Reserve Officers' Training Corps (ROTC) through one of the military branches. In the ROTC program they will train and prepare to be an officer in exchange for education benefits like financial aid, scholarships, and other support.



Newly commissioned officers of the U.S. Navy and Marine Corps toss their midshipmen covers in the air at the end of the class of 2014 graduation ceremony. Courtesy of DVIDS, Credit U.S. Navy photo by Gin Kai

Service Academies

Students attend service academies for free and receive a monthly living stipend in exchange for military service after graduation. Admission is highly selective and students must meet very demanding academic, leadership, and physical requirements.

There are five U.S. Armed Forces Service Academies:

- Air Force Academy, Colorado Springs, Colorado.
- Coast Guard Academy, New London, Connecticut.
- Naval Academy, Annapolis, Maryland.
- United States Military Academy, West Point, New York.
- Merchant Marine Academy, Kings Point, New York.

Military Colleges

Cadets at military colleges participate in ROTC but have the choice of whether or not they take a military commission after college.

There are six Senior Military Colleges:

- Norwich University, Norwich, Vermont.
- The Citadel, Charleston, South Carolina.
- Texas A&M, College Station, Texas.
- University of Northern Georgia, Dahlonega, Georgia.
- Virginia Military Institute, Lexington, Virginia.
- Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

There are also Military Junior Colleges. Through the Army ROTC's Early Commissioning Program (ECP), cadets graduating from these two-year programs are commissioned as Second Lieutenants as they continue to complete a four-year bachelor's degree at another college.

There are four Military Junior Colleges:

- Georgia Military College, Milledgeville, Georgia.
- Marion Military Institute, Marion, Alabama.
- New Mexico Military Institute, Roswell, New Mexico.
- Valley Forge Military Academy and College, Wayne, Pennsylvania.

Finally, California, Maine, Massachusetts, Michigan, New York, and Texas all have maritime colleges or universities where graduates can earn licenses for the Coast Guard and the Merchant Marine.

Reserve Officers' Training Corps (ROTC)

Navy Junior Reserve Officers' Training Corps (JROTC) students are no strangers to the ROTC program. The college and university equivalent is offered in each branch of the armed forces and there are programs at over 1,700 institutions of higher education. Sometimes students who do not have an ROTC program on their campus are able to participate at another local college or university. Students in the program train and take ROTC classes while also completing their college courses. While some students will participate in ROTC short-term without enlisting, those who do enlist have the opportunity to earn a scholarship for some or all their college education.

Enlistment

Some students will choose to join the military right after high school, joining one of the six service branches (Air Force, Army, Coast Guard, Marine Corps, Navy, or Space Force). Typically, those who serve will have four years of active duty followed by four years as an inactive service member. You must be at least 17 years old to enlist, and depending on the branch, there are age limits for how old you can be to join. To enlist, you must have earned a high school diploma or GED (General Educational Development) and be able to pass the fitness standards and test score minimums on the Armed Services Vocational Aptitude Battery (ASVAB). Some service members work toward a college degree in their off-duty time and can receive financial support to do this. Those who serve are eligible for the GI Bill, which provides support for education expenses. You will also get paid as you would for any job and earn money toward retirement.

Government Volunteering Opportunities

There are a variety of ways to serve your country. In addition to the military, there are state and federally sponsored service programs. Two of the largest programs are AmeriCorps and the Peace Corps. Under the AmeriCorps umbrella there are several different opportunities, from fighting climate change in Colorado to working in local government to addressing health issues or other community needs. Depending on the type of AmeriCorps program, you must be either 17 or 18 years old to apply.

Through the Peace Corps, volunteers who are 18 years old or older, travel to locations all over the world to live in and serve local communities. Both programs require an extensive application process and offer living expenses and education benefits. There are also a range of internship opportunities (often paid) for students and graduates to get experience in a specific field or job.

Continuing Education

It is easy to fall into the trap of thinking that learning takes place as part of a specific school experience or degree program. The reality is that education is ongoing and happens in many different ways and places. Continuing education is a catchall term that refers to all kinds of learning that is available after high school. This might be a formal college or trade school class, or it might be a workshop or seminar that you take online or in your local community.

Many jobs or fields require workers to complete specific continuing education requirements to stay current with the skills and knowledge that they need to be good at what they do. Doctors and nurses, for example, have to take continuing education courses to retain their license to practice. Some people engage in continuing education because they are curious about a topic and want to see if it is something they might want to explore further. While some continuing education might be academic in nature, others might be to learn a specific skill, such as beekeeping or knitting. No matter what you do after high school, hopefully you will take advantage of continuing education opportunities.

Roads to Citizenship and Naturalization

The United States has a rich history of welcoming individuals from all over the world to build a diverse country. *Citizenship* is a formal relationship between an individual and a nation state that establishes rights and responsibilities on both parties. U.S. citizenship offers great benefits and also comes with responsibilities.

There are four main ways to become a citizen. One is to be born in the United States (and territories). If you are reading this, that has already been decided for you. If you were not born in the U.S., but one of your parents is a U.S citizen (and meets some specific residency requirements), then you are eligible for citizenship. If neither of these apply, individuals may voluntarily become citizens through *naturalization*. To do so, they must meet age, residency, and other eligibility requirements that the Department of Homeland Security outlines on the U.S. Citizenship and Immigration Services website. Members of the U.S. Armed Forces may also be eligible for naturalization after serving honorably for a year. Children under 18 whose parents naturalize may also be eligible for citizenship through *derivation*.

Conclusion

As you can see, your options for life beyond high school are many. There is no right way, and the choices you make will depend on your circumstances. In the chapters that follow, you will learn how to research and pursue these different opportunities. Remember that your path might be different than your friends and that is okay. What is important is that you plan ahead and make decisions in an informed and thoughtful way based on your goals, interests, and strengths. You are going to grow, learn, and change, so stay open to all possibilities.

Critical Thinking

1. With all the various opportunities for continued schooling after high school, you have many options. Pick two paths and compare the potential benefits of each.
2. If you were to serve your country after high school, how would you do so? Would you join the military, volunteer with AmeriCorps, or follow some other path? What might you choose and why?

New Vocabulary

associate's degree
articulation agreement
bachelor's degree

Study Guide Questions

1. List three different options for schooling beyond high school.
2. List four ways in which trade schools, community colleges, and four-year colleges and universities differ?
3. What is dual enrollment?
4. What are three different ways to approach military service?
5. What is the main difference between AmeriCorps and the Peace Corps?
6. What are three potential pathways to becoming a citizen?

Web Resources

Federal Student Financial Aid: <https://studentaid.gov/resources/prepare-for-college/students/choosing-schools>

American Association of Community Colleges: <https://www.aacc.nche.edu/>

GI Bill: <https://www.va.gov/education/about-gi-bill-benefits/>

Service Academies: <https://www.defense.gov/Help-Center/Article/Article/2742283/military-service-academies/>

AmeriCorps: <https://americorps.gov/>

Peace Corps: <https://www.peacecorps.gov/>

USA Jobs: <https://www.usajobs.gov/>

U.S. Citizenship and Immigration Services:
<https://www.uscis.gov/sites/default/files/document/guides/chapter4.pdf>

Chapter 2

Setting a Foundation and Planning Ahead

What You Will Learn to Do

This chapter will help you start to identify your strengths, interests, and goals for the future. You will learn about tools for self-reflection and key questions you can ask yourself. You will explore the actions you can take now, both in and out of school, to plan for your next step.

Skills and Knowledge You Will Gain Along the Way

- ✓ What questions you should be asking yourself and others.
- ✓ Identifying strengths and interests.
- ✓ Tools for self-reflection and planning.
- ✓ Course selection in high school.
- ✓ Ways to be involved outside of class.
- ✓ How to set realistic goals.



Set a plan. Courtesy of iStock, Credit andresr

Self-Reflection

Before you start looking too far ahead, it is important to review your past and present. Who you are and what you have done will give helpful clues as you plan for what comes next? It's good to stop and look in the mirror and think about what you enjoy, who you like to be around, and what you value.



Take a look in the mirror. Courtesy of iStock, Credit fotojog

Start by thinking about the things you have done and are currently doing. Write down some notes about the types of activities you like and why you enjoy them. Do you enjoy volunteer work? Do you spend most of your time with friends or do you prefer to have more time to yourself? If you had a day to do anything, what would you do? Consider the people in your life: are you most comfortable with people who are high energy or more low-key?

In the next section you will learn about some of the most important foundational questions to ask yourself, but first take time to reflect on *who you are* before thinking about who you want to be and what you want to do. The following are some initial questions to consider:

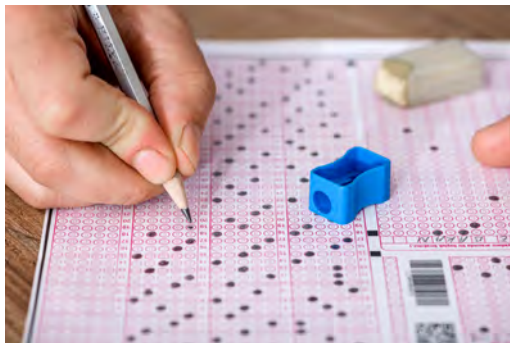
- What brings you joy?
- What values are most important to you?
- What concerns you the most?
- Which adjectives would you use to describe yourself?
- If you had to create a bumper sticker that best spoke to your identity, what would it say, and why?
- Describe a time or moment when you felt at your best.
- What are you grateful for?
- What do you wish was different about yourself?
- What are your best qualities?
- What are your weaknesses?

- What is your role in your family and friend group (for example: peacemaker, comic relief, planner, etc.)?
- What circumstances or experiences have shaped your growth and way of thinking?
- Which class/classes do you look forward to the most? Why?
- Which classes have been the most challenging? Why?
- What does it mean to live a good life?

Career Considerations

“What do you want to be when you grow up?” That is a question you have probably heard before. Maybe more than you would like! Perhaps there are jobs that you always dreamed of doing or careers that sounded interesting. Or you might have no idea what you want to do and that is okay. Depending on who you ask, or which study you read, the average person changes *careers* between five to seven times in their life and changes *jobs* almost twice as many times as that. Hopefully that takes some of the pressure off feeling like you must know how you will spend the rest of your work life.

You might plan to go right into the work world directly following high school or after more education or service of some kind. Either way, it is never too early to start thinking about the kind of work you might want to do and the types of jobs that will fit your interests and strengths. In the next chapter we will look more in depth at how to start researching and exploring different careers. For now, think about how you like to spend your time. Do you enjoy being active and multitasking or are you happier when you are focused on one thing in a more predictable environment? There are no right or wrong answers, but it is helpful to consider the types of settings in which you do best. If you have had a part-time or summer job during high school, what did you like and not like about it?



A multiple-choice career assessment. Courtesy of iStock, Credit turk_stock_photographer

There are a lot of different career assessments/inventories that you can take to help you identify possible jobs or work environments that will fit your strengths and interests. Ask your high school counselor if your school has access to one or search the internet for some of the free tools.

Career Spotlight

Brigadier General Len Anderson

Commanding General, 4th Marine Aircraft Wing

The path from high school to a military career can be very murky. This is what Brigadier General Len “Loni” Anderson discovered as he was nearing the end of his senior year in high school. Being born to a family that took military service seriously was not what enticed Brigadier General Anderson about the military; “It was the movie *Top Gun*. I saw it, and I knew that’s what I wanted to do.”

Brigadier General Len Anderson was commissioned in 1993 upon graduation from the Illinois Institute of Technology. He was designated a naval aviator in October of 1995 and selected to fly the F/A-18 Hornet.

As Brigadier General Anderson explains, “Your career and life generally do not have to be a straight path where one marches forward and leaves behind the things they want to accomplish.” Brigadier General Anderson’s entire military and civilian career boast many different interests, such as two years with the U.S. Navy Blue Angels, 15 years as a FedEx pilot, and over 25 years of active military and reserve roles in the U.S. Marine Corps, while also pursuing various acting roles.

Brigadier General Anderson held two principles that he continued to champion throughout his career, leading him to success. These principles are teamwork and consistency. As a member of the Blue Angels, the importance of teamwork became clear to Brigadier General Anderson through the thousands of hours of practice and proximity he and his team members experienced to pull off the artistry that their formations eventually displayed. “You have to remember you will not have it all figured out.” Brigadier General Anderson urges the importance of using consistency to take steps, no matter how small, towards the goals you have and ultimately forge your unique path forward. “Try not to worry about 5 or 10 years out. Do *this* right now, really well, and everything else will fall into place.”



Strength, Aptitudes, and Interests

New Vocabulary

aptitudes—
skills that you are
naturally good at

We all have unique strengths and **aptitudes**. Other skills we must work hard to develop because of an interest we might have. Maybe learning math has always just clicked for you but mastering a foreign language is more of a challenge. If you are interested in traveling abroad and want to learn a language, you might have to practice more than some of your classmates, but you could still develop a strength in that area.



Some people are born with a natural aptitude for math! Courtesy of iStock, Credit sturti

There are many different aptitude and personality inventories that will help you identify areas of strength and skill for you. StrengthsFinder, YouScience, and the Myers-Briggs Personality Indicator are just a few examples. You can also find free tools online or sometimes through your school counseling office.

Course Selection: Requirements and Resources

As you plan for the future, it is important to make sure that the classes you are taking in high school will position you well for your next step and meet the necessary requirements. Along with your school counselor, you should first be certain you have all the credits you need to graduate from high school. No matter what grade you are in, schedule an appointment with your counselor to develop a plan for the courses you will take from now until graduation. You can always change this as you find new academic interests and strengths, but it is good to have an initial road map.

Some colleges and universities have requirements for admission that go beyond what your high school sets for credits needed for graduation. Visit a few websites for colleges that you have heard of or might be interested in and look on their admission page to see what their minimum requirements, and preferred courses, are. Generally, colleges will want to see that you have challenged yourself in school appropriately and maintained good grades. Four years of the five core subjects (English, math, science,

history/social science, and foreign language) is ideal for selective college admission but depending on the type of school this may differ. Military service academies also have specific requirements, and some trade schools may expect to see previous training in the field you are applying for, so do your research early and again, use your school counselor as a resource.

Goal Setting

Before you start to think about setting goals, it is important to understand what they are. Are they specific or more general? In short, *goals* are outcomes you hope to achieve. They can be long-term or short-term, but are usually broader than objectives, which are steps you might take to reach your goal. A goal could be to do better in your English class this year or to become an officer in the military in the future. They can be aspirational but should also be realistic. You might want to be a professional basketball player, but if you are five feet tall, it might not be in the cards. If you want to become a lawyer and you are willing to work hard toward that goal, perhaps it is more likely.



What are your goals? Courtesy of iStock, Credit Coompia77

A common approach to goal setting is based on the acronym S.M.A.R.T. This stands for **S**pecific **M**asurable, **A**ttainable, **R**ealistic, and **T**ime-bound. Let's say your goal is to get a summer job in a field that you might be considering for your future career. It is specific because it relates to an interest you have in a certain area and measurable because you either earn a job or do not. This goal will be attainable and realistic if the field you are interested in has opportunities available for students your age to work in. It is time-bound because you are looking for the summer and not just some general time in the future. Once you have set a goal, you will need to put together a plan to work towards it and start to take action.

Conclusion

This chapter has been all about reflection, questioning, and getting to know yourself better to create a solid foundation. The rest of this unit will give you the knowledge and tools you need to move forward. You may want to return to this chapter and review the questions you answered as you explore careers, schools, and the decisions that lie ahead.

Critical Thinking

New Vocabulary

aptitudes

1. What is the most difficult self-reflection question for you to answer?
2. What are the graduation requirements for your high school?
3. Chose a college in your area and look to see what courses they require to be considered for admission
4. Look online to find a free career assessment and complete it. What do you notice about the jobs it suggests?

Study Guide Questions

1. What are two self-reflection questions that you think everyone should ask themselves?
2. Who is your best resource for academic course selection?
3. What does S.M.A.R.T. stand for?

Web Resources

The Myers Brig Foundation: <https://www.myersbriggs.org/>

Youscience: <https://www.youscience.com/>

Clifton Strengths: <https://www.gallup.com/cliftonstrengths/>

Career Tests: Our Top 10: <https://www.monster.com/career-advice/article/best-free-career-assessment-tools>

Roadtrip Nation: <https://roadtripnation.com/roadmap>

Chapter 3

Researching Colleges, Trade Schools, and Careers

What You Will Learn to Do

This chapter will guide you in how to best research schools, jobs, and other opportunities for life after high school. You will learn what resources to use and how to start.

Skills and Knowledge You Will Gain Along the Way

- ✓ College search tools.
- ✓ How to build a balanced, realistic college application list.
- ✓ Best approaches for visiting colleges.
- ✓ Ways to explore majors and careers.
- ✓ The benefits of internships and apprenticeships.
- ✓ Tips for interviews and how to use them as research tools.



Use all your resources. Courtesy of iStock, Credit pablohart

College Search and Building a List

Whether you are considering a trade school, community college, or four-year university, you need to be a smart consumer. This means starting early and doing the research necessary to fully understand your options. But where do you begin? Talk to the people around you, especially those who know you best. Family, friends, teachers, coaches, and others in your life who are familiar with colleges and trade schools can offer suggestions for you. Ask about their experiences if they continued their education after high school. Meet with your school counselor and ask for recommendations on how to start your search.



Start your list. Courtesy of iStock, Credit Vadym Pastukh

There are also many great online resources that can help you start to research colleges. Your high school might have a software program that is available to students, so ask your counselor. There are also free tools like Big Future, My Options, and the U.S. government's the U.S government's College Navigator that will help you narrow your search.

Your Search Criteria

Whether you are searching online, talking with your counselor, or discussing schools with family and friends, the following are some initial criteria to consider:

- **Cost.** Chapter 5 will cover this more in depth, but you should determine early on how much money you will have available to pay for college. Then look at the total cost of attendance and average financial aid package for each school you are considering. Some colleges will meet more financial need than others.
- **Setting.** Urban, suburban, rural? What environment makes you feel the most at home? What access will you have to transportation, stores, jobs, entertainment, local internships, etc.?
- **Size.** Are you more comfortable in smaller groups? If so, maybe a college under 2,000 students might be the best match. Or does the idea of a large campus experience with 15,000–30,000+ students excite you?

- **People.** How diverse is the student population? Is there a large international student community? Are most of the students from the local area/region or from all over the country/world? What are the socio-economic backgrounds of students? How representative is the diversity of faculty of the students who attend?
- **Location.** Do you want to be close to home or is college an opportunity to live in an area far different than you have been before? Are there certain states or regions that you prefer or that you want to avoid? Knowing this will help you narrow your search.
- **Academics.** Some students know exactly what they want to study, and others are still deciding well into their college years. As you look at schools, make sure they have programs that you are interested in and enough options and flexibility in case you are undecided or change your mind.
- **Athletics.** Are you hoping to play competitive college sports? If so, what division/level are you ready for? Are you going through the formal recruiting process? This could change where you might look for school. Maybe you want to play intramural or club sports. Or perhaps you want a school with popular Division I athletics (to watch but not play) and school spirit around those sports.
- **Special Programs.** Internship opportunities, study abroad, and student support service are just a few of the specific programs you might consider. Are there other resources that you want to have access to that may not be common on all college campuses?
- **Facilities.** From residence halls, dining services, and fitness centers to libraries, classrooms, and laboratories, the availability and quality of facilities differ widely on college campuses. What will be important factors in your search?

Research Do's

As you begin to explore colleges, consider some of these tips:

- **Keep an open mind.** A school that you have never heard of could be a great match for you.
- **Explore.** Start with the admission website as a hub of information about the school. Also read their student newspaper or alumni magazine, check out their social media sites, and read student blogs.
- **Register.** Sign up for the mailing list of any colleges you are interested in (you can always unsubscribe later!). This allows colleges to send you relevant communication about opportunities to visit campus, special programs in your area (like if they will be attending a local college fair), virtual visit opportunities, and reminders about important deadlines.
- **Visit.** If possible, go to campus and see it for yourself (more on this later in the chapter). You can also sign up for a virtual tour and/or information session. Sometimes these are live, and others are recorded to view at any time.

Research Don'ts

Here are some things to avoid as you start to research:

- **Judgment.** If there was something you didn't like about the school, consider doing more research.
- **Generalizations.** Be careful of evaluating a school based on a short interaction with your tour guide or information session presenter.
- **Status.** Resist using rankings and perceived prestige as guiding factors in your college search.

- **Procrastination.** Don't wait. Start your research early so that you have time to explore as you discover new programs and interests.

College Visits

One of the best ways to get to know a school is to visit, tour, and talk to community members. While ideally you will do this in person, there are also opportunities to do virtual visits online at many schools. Either way, make the most of your visit by considering some of the following tips.



Head out on college tours. Courtesy of iStock, Credit SDI Productions

Helpful Hints

- **Make it official.** While any visit to a college campus is useful, if possible, take the time to register with the admission office and participate in their formal tour and information sessions. Not only will you learn more, but it is also a good way to show them your interest. Some colleges also host open house programs, where they welcome hundreds or thousands of visitors to campus to learn about the institution.
- **Plan ahead.** Tours and other programs can fill up quickly. Register for your visit well in advance. You can usually book your tour and information session through the college's admission website or by calling their office. Allow enough time on campus to get the full experience. Don't try to visit more than two schools in a day. You can usually arrange your visit through the admission website or by calling their office. If you have special interests, contact coaches, music directors, academic departments, etc. beforehand to set up meetings while you are on campus.
- **Connect.** Ask to speak with the admission officer who is responsible for your high school or the area where you live to introduce yourself. If that individual is not available, ask for their contact information/business card so you can send them an email after your visit. Often this is the individual who will read your application, so it is good to make a connection.

- **Network.** Reach out to friends or graduates from your high school who are current students and try to talk to them when you visit. Your counselor might have a list of alumni who attend different schools. LinkedIn® professional networking services and other social media can also be useful for making these connections.
- **Explore.** Allow extra time during your visit to look around campus on your own after the official tour. Have coffee in the student center or see if you can have a meal in the dining hall. Speak with some random students or professors to hear their impressions of the school. If time permits, explore the local area surrounding campus. Are there certain restaurants, coffee shops, shopping areas, or parks that students frequent? Is there a lot within walking distance of the campus, or would you likely need a car or to use public transportation?
- **Sign up.** Arrange an admission interview, if offered by the school. These usually are available starting in the spring or summer of junior year.
- **Take note.** Immediately following your visit, write down your impressions of the school. List five things you liked and five things you did not, along with any questions that did not get answered or things about the school you'd like to learn more about.
- **Follow up.** After your visit send a thank you note or email to the tour guide and admissions officer who gave the information session.

Career Exploration

In Chapter 1 we looked at types of jobs by sector. In Chapter 2 we discussed some ideas about careers for you to consider when thinking about your strengths and interests. But how do you start to learn more about the specific aspects of different jobs?



What jobs will be right for you? Courtesy of iStock, Credit NicoEINino

Shadowing and Informational Interviews

Job shadowing is just what it sounds like. To learn more about a career or specific job, you spend anywhere between a few hours to several days following a professional around as they do their work. This allows you to experience their schedule, the types of challenges they face, and interactions they have. It is a great way to get a sense of the day-to-day life of someone in that career.

Informational interviews are shorter meetings where you might talk with someone in a specific field or career to learn more about what they do. These conversations are not meant to lead to a job with that person or company (though sometimes they do). Instead, it is an opportunity to ask open questions and figure out if that job might be a good fit for you in the future.

Internships and Apprenticeships

An **internship** is a short-term opportunity to work in a specific field to gain hands-on experience in that area. It might last only a week, or it could be longer than a year, but it is not permanent. Some internships are paid, and others are volunteer with the major benefit being the experience you gain and knowledge of that job.

An **apprenticeship** is on-the-job training where an individual learns a trade while working with an established professional. Apprentices are usually paid and often last at least a year or longer if more time is required to learn the skills necessary to be successful. Apprenticeships are most common in technical fields and industries like manufacturing. Workers can sometimes earn certification at the end of their apprenticeship.

Know Your Resources

A critical part of researching careers and schools is understanding how to get the information you need. It can sometimes be difficult to know what is quality, fact-based information and what is not. There can be information overload so you might need help making sense of it all.

It is important to know who you can turn to as you figure out next steps. Start by identifying your team or unit. Who are the individuals in your life who you can trust and have the experience to help guide you? These may be family members, a pastor, coach, employer, mentor, teacher, or friend. Make a list of people who you want to support you and to tell them what you need. Your school counselor is a great resource, and your school might also have a college and career center or library with tools to help with your search. Many towns and states also have community-based organizations that offer programs to help with college and career research and planning.

How to Interview for a Job, College, or Scholarship

Interviewing is an important life skill. Whether you are applying for a summer job, internship, college admission, scholarship, or permanent work, it is likely that an interview will be part of the process. Though it is unclear who first said it, there is truth in the quote, "You never get a second chance to make a first impression." How you present yourself and talk about your experiences will leave a lasting impact.

New Vocabulary

internship–

work in an organization, sometimes without pay, to gain experience or satisfy requirements for a qualification

apprenticeship–

opportunity to learn a trade, art, or job while working under an established professional



Be prepared for you interview. Courtesy of iStock, Credit pixelfit

Not all companies and schools conduct interviews, but you want to be prepared for those that do. The purpose of an interview depends on the company or school but generally they are trying to learn more about you than is on your application or resume and to see if you are a good fit for their organization. Often interviews are to evaluate you in some way, but sometimes they are just to share information. Make sure you are clear about the purpose and structure of the interview beforehand, so you know how to approach it.

Who the interviewer will be also varies from situation to situation. Sometimes for jobs you will meet with the human resources office or hiring director and other times you will interview directly with the individual(s) with whom you would be working. For college and scholarship interviews, you might be talking with an admission officer, faculty member, student, or alumni of that school. Find out ahead of time who you will be meeting with so you can prepare. Here are some other interview tips and potential questions you might be asked and can ask yourself.

Helpful Hints

- **Research.** Be sure to do your homework and research the company or school where you are interviewing. Explore their website and talk to people familiar with the place. You want the interviewer to know that you are interested enough in their company/school that you have taken the time to find out details and so you are able to explain why that company/school is of interest to you.
- **Plan ahead.** If you have never been to the job site/college campus before, make sure you know where to park and where to go once you arrive. Give yourself plenty of travel time and try to arrive a few minutes early so that you are not entering the interview feeling rushed.
- **Bring.** Take a copy of your high school transcript to share with the interviewer (don't hesitate to talk about your course program with them); a resume if you have one; a portfolio if applicable; and a notebook to make notes about your impressions and to write down some questions that you will ask about during the interview.

- **Dress.** Wear clothes that are appropriate for the company or school where you are interviewing. Be yourself but put your best foot forward (be genuine and show them the best of who you are). If you are interviewing for a job in a formal office setting, you will probably want to wear business attire. Leave your hat in the car.
- **Behavior/posture.** *Don't:* flirt, slouch, put your feet on the furniture, chew gum. *Do:* make eye contact, give a firm handshake before and after the interview.
- **Communication skills.** Be yourself but be the sophisticated side of you. Avoid slang, inappropriate words, and nondescript words such as “like”, “things”, “whatever”, and “stuff”. Don’t try to impress the interviewer with elaborate speech that will seem too forced.
- **Modesty vs. bragging.** Don’t be afraid to tell your interviewer all the wonderful things about you. Don’t play down your accomplishments but be careful of “showing off” too much. Don’t try too hard, just be yourself and tell them what you are passionate about.
- **Questions.** Always have several questions that you will ask the interviewer about the company/college. They will no doubt leave time in the interview for you to find out more about the college. Examples of potential questions are listed below. Don’t ask obvious questions that you can easily find the answer to on the website, such as: “How many students attend the college?”, “Do you have an English major?”, or “What is this company’s mission?”
- **If a question stumps you.** It is perfectly acceptable to ask if you can come back to that question later after you talk some more.
- **Follow-up.** Always make sure you ask for a business card and send a thank you note to the individual with whom you interviewed. This will go in your application file, and it is just one more indication of your interest in the company/college, not to mention your great manners!

Conclusion

The research stage of the search for a job, college, or trade school should not be rushed. Plan ahead, use your resources and don’t settle for easy answers. Don’t be afraid to ask questions and dig deep until you are satisfied that you have all the information you need to make good decisions.

Critical Thinking

New Vocabulary

apprenticeship
internship

1. Choose two colleges or trade schools to research, one you have heard of before and another that you know nothing about. What are two aspects that stuck out about each school?
2. Write down to areas of academic interest you have. What major(s) would allow you to study those subjects in more depth? What are some examples of careers that graduates go into from those majors?
3. Pick two interview questions that you might be asked in a job or admission interview and write down your answers.

Study Guide Questions

1. What is one thing you should do when starting your search for schools?
2. What is a good question to ask on a college tour?
3. What is the difference between an internship and an apprenticeship?
4. What should you do if you don't have a response to a question that you are asked in an interview?

Web Resources

Learn How to Become: <https://www.learnhowtobecome.org/>

What Can I Do With This Major: www.whatcanidowiththismajor.com

My Majors: www.mymajors.com

Big Future College Search: www.bigfuture.collegeboard.org

My Options College Search: www.myoptions.org

College Navigator: www.nces.ed.gov/collegenavigator

PayScale: www.payscale.com

Road Trip Nation: www.roadtripnation.com

PBS Career Videos: www.nhpbs.pbslearningmedia.org/collection/career-connections

Occupational Outlook Handbook: <https://www.bls.gov/ooh/>

United States Department of Education: www2.ed.gov/students

United States Department of Labor: <https://www.dol.gov>

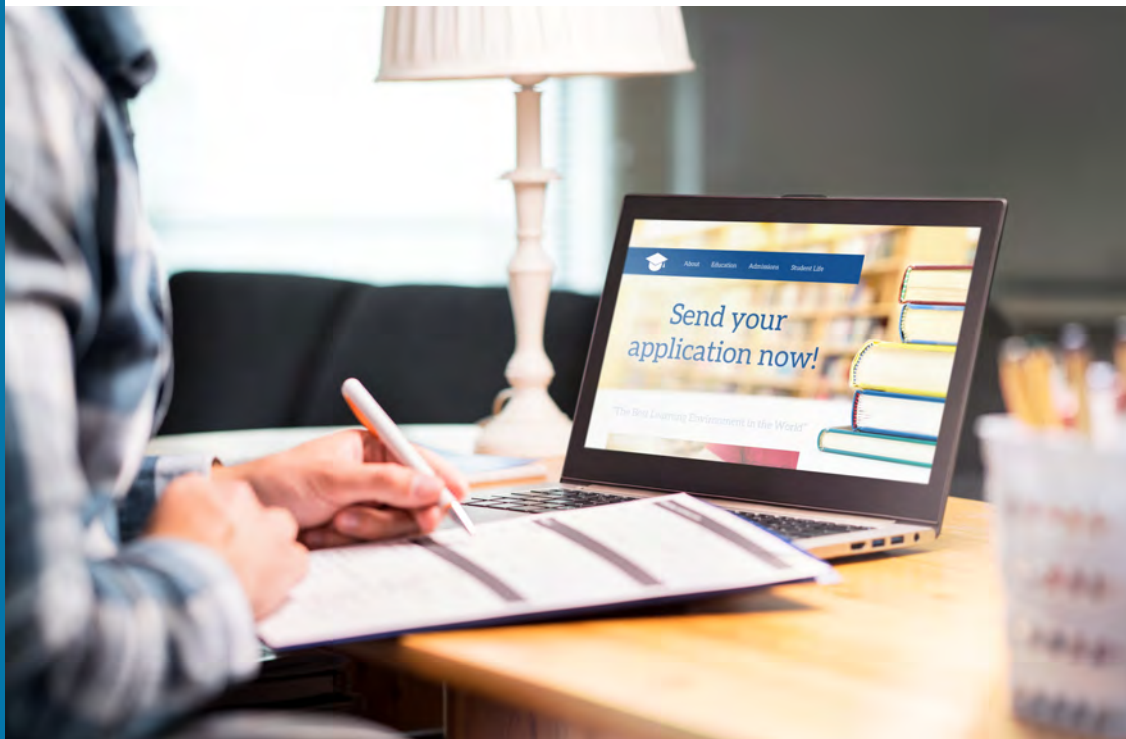
Applying to Trade School or College

What You Will Learn to Do

In this chapter you will learn all the steps to apply to trade schools, community colleges, and four-year colleges and universities, as well as the financial aspects associated with this process. A common theme throughout all application processes is, “it depends.” While there are some standard requirements and ways to apply, every school is a little different. Make sure you plan ahead and are clear about what each school and program is looking for. It can be helpful to make a spreadsheet of the schools to which you are applying and their requirements and deadlines. That way you can check tasks off as you complete them.

Skills and Knowledge You Will Gain Along the Way

- ✓ How to apply, which applications to use, and common deadlines.
- ✓ Where to find application requirements.
- ✓ Determine the actual cost of post-secondary education.
- ✓ Learn about different types of financial aid.
- ✓ Ways to earn scholarships.



Applying for college can be a lengthy process, so make sure you get started early! Courtesy of iStock, Credit Tero Vesalainen

Trade School Admission

Applying to most trade schools is straightforward. You will need to meet the minimum basic requirements, such as earning a high school diploma and being at least a certain age (usually 17 or 18). If you are not a high school graduate you might also qualify by earning a **General Education Development (GED)** credential, which is a test that shows you have the academic skills equivalent to having graduated from high school. Some trade schools will require additional testing (like a placement exam) for some programs, but if you have taken the SAT or ACT, they will often accept those scores as well. Depending on the trade you are applying for, you might also have to do an interview and/or have prior work experience in that area. They usually don't ask for recommendations, essays, or other materials. Trade schools typically have ongoing admission and depending on space in the program, there are multiple start dates.

New Vocabulary

General Education Development (GED)—*a group of four subject tests that indicate you have a high-school level of education*



Most trade schools and community colleges have rolling admission. Courtesy of iStock, Credit Chee Siong Teh

Community College Admission

To take classes at a community college, usually you can just register and if there is space, you are all set. Some students take community college classes while in high school either on their own or through a dual-enrollment agreement with their high school. For specific courses, you might need to have passed another required course (especially in math and foreign language) or take a placement test so that they can be sure you are in the right level and can be successful. Students applying for associate's degrees or certificate programs will often have a more formal admission application that requires proof of high school graduation or the equivalent (GED). Community colleges usually have rolling admission where you can apply anytime for the next semester (fall, spring, or summer).

Four-Year College and University Admission

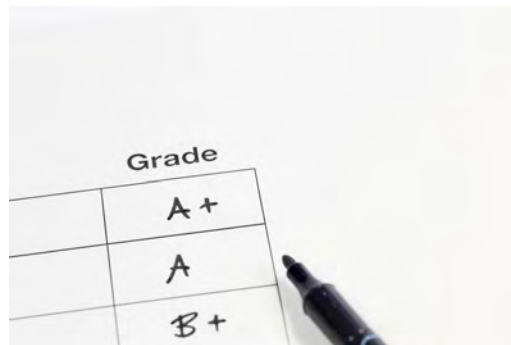
The process of applying to bachelor's degree programs at four-year colleges and universities usually involves more steps and requirements than trade schools in community colleges. There are two main approaches to admission: formulaic and holistic.

Formulaic admission is based primarily on numbers like a grade point average (GPA) and/or standardized test scores. This approach is most common in large state universities or systems. Essentially, if your grades/test scores are above a set bar, you are eligible for admission.

Holistic admission is used at colleges and universities that have more selective application processes and often factors in your involvement and other aspects of your high school experience. The qualifications for admission vary depending on the school and how selective it is, so be sure you understand what is required and how they are making decisions. You can find specific information on the institution's admission website. Consider the following factors as you prepare for college applications:

Academics

Your high school record is usually the most important factor when colleges review your application. They will require you to submit your **transcript**. Many colleges have minimum requirements for which courses you must have successfully completed. Here are some common criteria:



Your high school transcript will list all your classes and grades. Courtesy of iStock, Credit Tongsur

- Four years of English.
- Three years of math, including at least geometry and algebra 1 and 2.
- Two or more years of history/social studies, including U.S. history and world history.
- Three or more years of science, including laboratory courses in biology, chemistry, and physics.
- Two or more years of a foreign language.
- Art courses.

Check each college's admission website for requirements specific to that school and the academic program to which you are applying. The more selective colleges and programs will be looking for students who have gone beyond the minimum requirements. For example, many engineering programs require that students have taken calculus and physics in high school. When the admission office is reviewing your application, they will be looking at the courses you have taken in the context of what is available at your high school. In selective college admission, they want to see that you have challenged yourself by taking advanced courses (Honors, AP, IB, Dual Enrollment), if possible, and done well in demanding classes. They are also looking at trends in your grades. If you struggled academically in 9th grade but improved every year, they will factor that into their decision. Likewise, if your grades go down, they will take note.

New Vocabulary

transcript—
official document that lists all the classes you have taken and the grades you earned

Standardized Testing

Some applications require that you submit scores from the SAT or ACT to be considered for admission. Though the format and length of these tests differ slightly, colleges that require them do not prefer one test over the other. Both tests are offered on set Saturdays throughout the year and are usually taken in 11th and 12th grades. Some high schools also offer these tests during the school day to students from that school. There is a fee to take the test but students who qualify based on family need may be eligible for a fee waiver that allows you to take standardized tests for free. Many schools also offer practice tests for the SAT (PSAT) and ACT (PreACT) for younger students. Students who have taken Advanced Placement (AP) or International Baccalaureate (IB) exams and have done well might also choose to submit these scores with their application to show academic achievement.

There is a growing list of colleges and universities that have **test-optional** policies. At these schools, if your test scores are below the average for students who are admitted, you may choose to apply without sending test scores. Some colleges and state systems do not use standardized testing at all for admission. Students applying to colleges that do require testing and whose scores are below the average for those schools often find it helpful to study for the tests and prepare by taking practice tests and learning strategies to be successful. While there are classes and tutors that charge for these services, there are also many free resources for test preparation like Khan Academy. Ask your school counselor for additional resources that may be available through your high school.

New Vocabulary

test-optional—
*students can decide
whether they submit
SAT/ACT scores*

Extracurricular Activities

In addition to understanding your academic record, colleges and universities also want to know who you are outside the classroom and how you are involved. Because you are applying to be part of a community, they are interested in what you might contribute to and take advantage of. Most applications will ask you to write down the activities, clubs, work, and service experiences that you have had.

They are not looking for a long list of many activities that you only spent a little time doing. Instead, they are curious about the interests you have and how you have pursued those things. Maybe that's a school club, job, church youth group, theater cast, or sports team. They want to know how invested you have been in the activity and what impact you made. Did you take a leadership position or work on a special project? How many hours do you typically spend doing the activity?



Climbing is one activity students might be involved in. Courtesy of iStock, Credit SolStock

Admission officers also value the contributions that an applicant makes to their family and community. For some students that's helping care for a younger sibling or older relative. Perhaps you hold a job or spend time volunteering. These are all things that they appreciate when reviewing applications. Programs like JROTC also make students stand out because it is a commitment of time and energy. There is no right or wrong activity or experience, but the important point is that you should find ways to be involved.

Essays

Many colleges will ask you to submit an application essay or personal statement. This is an opportunity for the admission office to learn more about you beyond your grades and involvement. Sometimes they will give you a specific prompt, or choice of prompts, to write about. Many schools will also let you choose a topic that you want to write about and that you think shares something important about you.

Start working on your essay early so you have time to revise it. Also have a trusted mentor, like a teacher, family member, or your school counselor look over it for grammar and style and ask the reader what they learn about you. Typically, your primary college essay will be limited to 650 words or less. In addition to your main college essay, some schools will ask supplemental questions. These are shorter essays (usually a paragraph or two) to learn more about you and why you are interested in their school.

Athletics and Arts

Some students have excelled in sports and want to continue playing in college. Those students need to decide, with the help of their coach, about the level of competition that they will be ready for. Many varsity sports in college actively recruit high school athletes for their teams. The National Collegiate Athletic Association (NCAA), which oversees many of these sports, has very specific requirements and guidelines around this process so make sure you talk with your high school/club coach and school counselor about how best to approach this and when. Recruitment often starts early in high school, so it is good to plan ahead.

Programs in the performing and fine arts often have specific requirements as well. For music, theater, and dance, competitive programs have auditions where applicants must perform in order to be assessed for admission. Students who are applying to architecture, design, and other art programs are typically asked to submit a portfolio of their work for review. The deadlines and details about these auditions, portfolios, and other materials that need to be submitted are outlined on the website for those specific departments and usually on the admission website as well.



Some music programs require an audition. Courtesy of iStock, Credit vonntra

Letters of Recommendation

It is common for colleges and universities to ask for letters of recommendation from teachers and your counselor when you apply for admission. Each school has different requirements—some just want one recommendation and others want multiple letters in support of your application. You should plan on asking a teacher who has had you in class in your junior or senior year so that they can speak to your most recent progress. Often applications will ask for a recommendation from someone who is familiar with your ability to write, like an English or history teacher. Some technical schools and engineering programs also require a recommendation from a math or science teacher. Make sure you are clear about what each school is asking for and reach out to your teachers early to request a recommendation so that they have time to work on it.

Application Types

Many colleges and universities have links on their admission website where you can begin your application. Some schools have their own application forms and others use the *Common Application*, a shared platform that allows students to apply to up to 20 schools of over 900 colleges using one application. The Coalition Application, is a similar application that students can use to apply to over 150 different schools. Some colleges accept either of these applications, and those that use both do not have a preference for which one you apply with. Be aware that even colleges and universities

that use these shared application platforms often have supplemental materials to submit and school-specific questions that you need to answer as you apply to each individual college.



With one click you may be able to apply to multiple schools. Courtesy of iStock, Credit Fizkes

There are also larger state systems like Texas and California that have their own universal application that students must use to apply to in-state institutions. As with tests, many schools charge fees to apply and eligible students can have this cost waived by talking with their counselor or asking the college.

Application Plans and Deadlines

There are many different deadlines and ways to apply to a four-year college or university. Some schools give you options for how to apply and others have just one or two deadlines. The following are types of application plans for an application for a fall semester start:



Make sure you keep track of deadlines. Courtesy of iStock, Credit AndreyPopov

- **Rolling admission.** Ongoing review of applications in order of submission. Admission offers are extended on a rolling basis until the spots are filled, at which time most schools will still accept applications for the waitlist.
- **Early Decision (ED).** A binding agreement where a student will commit to enrolling if admitted. Many colleges offer two rounds of Early Decision, ED usually in early November and EDII in early January.

A few colleges allow applicants to apply Early Decision on a rolling basis, meaning that at any time during the admission cycle an applicant can decide to enter into a binding agreement in consideration of their candidacy. A student may apply ED to only one college, but can apply to other colleges simultaneously through non-

binding plans (EA, Rolling, RD)—though those applications must be withdrawn if a student is admitted through ED.

- **Early Action (EA).** A non-binding admission plan with deadlines typically between mid-October and late November. EA decisions normally released in December or January.
- **Restrictive Early Action (REA)/Single Choice Early Action (SCEA).** A hybrid admission plan allowing students to apply and receive decisions early under a non-binding application. In doing so they agree not to apply to another school under a binding ED plan at the same time.
- **Regular Decision (RD).** The standard admission plan with deadlines usually in early January or February and notification in mid-March through April.
- **Priority deadlines.** A decision plan (often November 30th or December 1st) allowing a student to be considered in the school’s first round of review. This is often found at large state systems such as The University of California.
- **Priority applications.** Also called VIP applications, “snap apps,” “fast apps,” and a range of other names. They refer to streamlined applications (prepopulating biographical information) designed to encourage students to apply early. In many cases, schools using these applications waive application fees and essay requirements.

College and Trade School Costs and Affordability

Your public education is paid for through the end of high school. After graduation, the financial responsibility shifts primarily to you. While post-secondary education can be expensive, there are ways to make it more affordable, so don’t be scared away. You need to have a complete understanding of the actual costs of trade schools and colleges and the financial aid options available. The amount of money schools charge will vary widely depending on what they offer and whether they are public, private, for profit, nonprofit, residential, and several other factors. Beware of sticker shock, where you look at the listed price and assume you will pay that much. A 2018 report by the National Center for Education Statistics explained that families often overestimate what they will ultimately pay to attend a particular school (Velez & Horn, 2018).

It is important to understand the actual bottom-line cost to attend college after factoring all fees, what your family can contribute, and any state, federal, or institutional financial assistance. Simply looking at *tuition* (the money charged for your education) and *room and board* (housing and meals costs) does not tell the whole picture. Thanks to a congressional mandate, colleges and universities that receive federal funding must publish their school’s total **cost of attendance (COA)**.

What you should be more concerned with is the Net Price of attending a college—the amount you will pay out of pocket after financial aid. For a quick estimate of what this might look like for each college, families can use the **Net Price Calculator**, a federally mandated tool that each school has on their financial aid website. This resource allows you to see a ballpark financial aid package for which you might be eligible.

Here is some of the information you will be asked to gather and enter into the calculator:

- Previous year’s tax return data.
- Adjusted Gross Income (found on tax return).
- Family information, like siblings in college, custodial and non-custodial parental information.
- Business owners’ accurate income and assets.

New Vocabulary

cost of attendance (COA)–

tuition, room, and board, as well as averages for fees, books, supplies, transportation, and personal expenses

Net Price Calculator–

a tool allowing families to see an estimated financial aid package for which they might be eligible

- Complex situations (health issues/medical expenses, disasters, deaths, etc.).

Another good place to start to learn about the price of trade schools and colleges is the U.S. Department of Education’s College Affordability and Transparency list that provides data on costs by different sectors. What follows is a snapshot.

Trade Schools

The cost of earning a credential at a trade school could be as low as \$1,000 or over \$50,000 depending on the trade, length of the program, and type of certification. Some trade schools are eligible to provide students with federal aid, especially those that are affiliated with community colleges. Some programs also have private scholarships and institutional support for students who cannot afford to pay the full cost.

Two- and Four-Year Colleges and Universities

The College Board’s 2021 Trends in College Pricing Report found that the average yearly cost of tuition and fees at two-year public institutions was \$3,800 (\$13,130 if you add room and board). The same study reported that on average four-year public colleges cost \$22,690 for in-state students and \$39,510 for out-of-state students for tuition, fees, room, and board. Meanwhile four-year private nonprofit schools averaged \$51,690 per year. These are just averages and some private colleges have a total cost of attendance that soars over \$70,000. Remember, not everyone pays this full amount and sometimes the schools with the highest cost offer the most aid. We will now look at financial support for higher education.

Need-Based Financial Aid

When it comes time to apply to college, families will need to apply for **need-based financial aid**. Need-based aid is a combination of federal, state, and institutional grants/scholarships, loans, and other financial assistance offered to a student based on their ability to pay for their education and their demonstrated need for support.

Financial Aid Forms

All schools that offer need-based federal financial aid will require the Free Application for Federal Student Aid (FAFSA) and many colleges (especially private institutions) also ask for the College Scholarship Service Financial Aid Form (CSS Profile). Depending on specific family circumstances, other forms may be required, which is why it is important that you visit each college’s financial aid website to be certain you have submitted the necessary materials before the deadline. The deadlines for financial aid forms are often the same as—or right after—admission deadlines. This is important to understand because you need to apply for aid before you know if you have been admitted to the school.

Using these forms, colleges calculate the **Student Aid Index (SAI)** which was formerly known as the Estimated Family Contribution (EFC). Your *demonstrated need* at a college is the cost of attendance, minus your SAI. For example, if a college costs \$50,000 a year and the SAI calculation determines that you have \$10,000 a year in financial resources to contribute, your need is \$40,000.

New Vocabulary

need-based financial aid–

financial assistance based on your family's financial situation determined by the federal government

student aid index (SAI)–

calculation of available financial resources to pay for college for one year



There is financial support available but make sure you know what forms are required. Courtesy of iStock, Credit designer491

Types of Need-Based Financial Aid

Support based on your financial need might come from several different sources including your state, the federal government, and the college itself. The following are common types of aid:

- **Grants.** Money awarded to a student in “gift aid”. These awards come at no cost to the student and do not have to be paid back in the future.
- **Pell Grant.** A federal grant based on significant financial need that does not have to be repaid.
- **Federal Direct Loan.** A federal loan for students (formerly known as the Stafford Loan).
- **Subsidized Direct Loan.** A federal loan available to students with financial need. Amount available to borrow is determined by your year in school and may only go to meet demonstrated need.
- **Unsubsidized Direct Loan.** A federal loan available to students regardless of financial need. Amount available to borrow is determined by year in school.
- **PLUS Loan.** A low interest government loan for parents.
- **Federal Work Study Program (FWSP).** A form of financial aid awarded to a student who demonstrates financial need through their FAFSA. Typically, this includes an on-campus job.

Admission and Financial Need

There are a small number of well-resourced colleges and universities that can afford to practice need-blind admissions. This is the process of reviewing applicants for admission in which a student’s ability to pay *is not* taken into consideration. The opposite of that is need-aware admissions, where a student’s ability to pay *is* taken into consideration when their application is reviewed. Some schools have smaller financial aid budgets and therefore must factor in who can pay to attend.

Sometimes a student will be admitted and there will be unmet need in their financial aid offer from a college. This is also referred to as “gapping” and is the difference between a student’s financial aid award (gift aid, work study, need-based loans) and a student’s demonstrated financial need. It is a practice colleges use when they are unable to meet the full demonstrated need of all admitted students. As you build your college application list, make sure you understand the policies they have about need-based financial aid.

Merit Aid and Scholarships

The term *merit aid* most commonly signifies scholarships based not on need but rather on achievement, whether that is academic, artistic, or some other attribute or talent.

Institutional Scholarships

Generally speaking, these awards do not require a special application, but rather students are identified during the admission review and are offered scholarships as the result of high grades, rigorous coursework, and testing (if applicable). The names of these scholarships vary by college and university, but usually, there are different set levels of funding (for example, deans, presidential, trustees' scholarships). The amounts might range from as little as \$2,500 to the full cost of attendance (these are rare though).

A few colleges and universities have endowed scholarships that may require a nomination from a high school official or a special application/deadline for students to apply. A few examples are the *Jefferson Scholarship* at The University of Virginia, the *Morehead-Cain Scholarship* at The University of North Carolina, and the *John Montgomery Belk Scholarship* at Davidson College. As one might imagine, these scholarships are extremely competitive and often cover the full cost of attendance. Most programs will choose a few applicants to invite to campus for interviews in the final stages of selection.

Local Scholarships

Often local Rotary, Elks, and Lions clubs sponsor college scholarships, as do men’s or women’s leagues and other organizations within individual towns. Fire departments, hospitals, and churches can also be sources of scholarship aid, often reserved for students from their area. Usually, these are limited to gifts of \$500–\$2,000 and require an application with an essay and/or recommendation. Sometimes high schools also have alumni scholarships, or a parent’s company might have scholarships for children of employees. Check with your school counseling office, as this is where organizations typically send announcements and applications for their specific scholarships.



With some effort you could earn a scholarship for college! Courtesy of iStock, Credit DMEphotography

National Scholarships

As a public service (and marketing opportunity), many large national corporations and organizations have established college scholarships to reward exceptional young people. Some are directed at first-generation college students or students of diverse backgrounds, and others are open for any student who wishes to apply. Depending on the organization, there might also be a financial need component as they look to create access for under-served students. A few examples are the *Coca-Cola Scholarship*, *GE-Reagan Foundation Scholarship*, *Wendy's Heisman Scholarship*, *Comcast Leaders and Achievers Scholarship*, and *The Gates Scholarship*. Another well-known scholarship provider is the *National Merit Scholarship Corporation*, which initially bases competition on test scores from the Preliminary SAT (PSAT) taken in the fall of your junior year. These are among the most selective scholarships because students from all over the country are in consideration. The JROTC and ROTC also both offer scholarships that can help you with college costs.

Foundation Scholarships

These sources of financial assistance again vary in dollar amount and selectivity and are generally available from philanthropic family foundations. Eligibility may be limited to students from specific backgrounds or geography and the scholarships often have other priorities attached, like students planning to study medicine, law or another specific discipline or career. For example, the Lilly Endowment Community Scholars Program provides full college scholarships to students from Indiana. Again, check with your school counseling office or do an internet search to identify scholarships that might apply to you.

Athletic Scholarships



While limited, athletic scholarships are possible. Courtesy of iStock, Credit RichVintage

The dream of a “full ride” for most athletes is just that—a dream. In fact, according to the National Collegiate Athletic Association, fewer than two percent of high school athletes will receive a scholarship to play in college. Only Division I and II athletics offer scholarships, and depending on the sport, the budget will vary. Coaches who do have money to spend on building a team often have to spread these funds around, so do not plan to cover the bulk of your college expenses with sports talent alone. For students who do earn

sports-based scholarships, make sure you are clear about the small print and how these opportunities will impact other financial assistance for which you may be eligible.

Scholarship Contests

There are countless other miscellaneous scholarships that are awarded for everything from spelling bees to beauty pageants. Scholarships exist for writing contests, art competitions and just about every other category one could imagine. Typically, these scholarships are limited in dollar amount unless they are large national programs. However, money is money, so it can’t hurt to compete or apply.

Finding Scholarships

Students applying to college need to be resourceful in order to secure scholarship aid. This might mean applying to colleges that are less selective or outside your initial application list. It also requires special attention to detail and deadlines. Check the financial aid website for each college to which you are applying to see if they offer scholarships and what their process is for consideration. There are also search engines that will allow you to build a profile and find scholarships that match your interests, backgrounds and/or talents. A few examples are the College Board, College Data, Finaid, Fastweb, and the U.S. Department of Education’s Federal Student Aid website. Keep in mind that most financial assistance comes through the financial aid office at a given college, and “outside scholarships” often are deducted from the institution’s aid package. Be aware of scholarship scams and skeptical of any company that promises to win you scholarships for a fee. You should never have to pay to be considered for a scholarship.

Student Loans and Debt

Between 30–40 percent of undergraduate students take out loans each year. Over two-thirds of students take out loans to help pay for their education at some point during college. Here are some other statistics to consider:

- The average student loan debt nationally is nearly \$40,000.
- A 2021 study from the National Association of Colleges and Employers (NACE) found that the average starting salary for graduates of four-year colleges was \$55,260.
- The average monthly student loan payment is estimated to be \$460.

If you have the average debt after college graduation and the average salary, that means you will be spending almost one fifth of the money you make to pay back college. Can you afford this while paying for rent, food, a car payment, and other expenses? Before you take on too many loans, be sure you consider the whole picture and how student debt will play into your overall finances.



Plan for how debt will impact your future. Courtesy of iStock, Credit Andres Victorero

Conclusion

Trade school and college admission do not have to be stressful. Yes, depending on the program and type of school, there might be a lot of details and requirements to keep track of. But if you plan ahead and stay organized there are a lot of opportunities that you can access.

Whether you are applying to trade schools or colleges and universities, there are affordable pathways. As with any big purchase you make, it is crucial that you have all the information you need to make a good decision. The financial aid office at schools are good resources to learn more and have counselors ready to support you. Many local and state governments also have programs to advise families about financial aid and planning. You don't have to go at this alone so consult your school counselor and be sure you understand what is available to support your goals.

In the next chapter we will explore how to afford colleges and trade schools where you have been accepted.

Critical Thinking

1. If you were asked to write a college essay about an experience or interest, what topic would you choose?
2. Which teacher knows you well enough to write a college recommendation for you?
3. What ways have you made a positive impact on your school, local community, and/or family? Are there additional activities you might want to get involved in?
4. What will be your most likely source of financial support for trade school or college?
5. Pick one school you are considering and explore their financial aid website. How much aid does the average student receive? What forms and deadlines do they have?
6. Choose a college and use the Net Price Calculator on their website to estimate how much financial aid you would receive.

New Vocabulary

cost of attendance (COA)
General Education
Development (GED)
need-based financial aid
Net Price Calculator
student aid index (SAI)
test-optional
transcript

Study Guide Questions

1. What are the basic requirements for most trade schools?
2. Do you have to wait until you graduate from high school to take classes at a community college?
3. What are the two main college admission tests?
4. What is the most important factor that four-year colleges and universities consider in admission?
5. What form does every student need to submit if they want need-based financial aid?
6. What is the difference between an Early Action application and Early Decision application?
7. What is the difference between a loan and a grant?
8. What is the average monthly student loan payment?

Web Resources

Common Application: www.commonapp.org

Coalition Application: www.coalitionforcollegeaccess.org

SAT: www.collegeboard.org

ACT: www.act.org

Test-Optional College List: www.fairtest.org

Khan Academy Free Test Prep: www.khanacademy.org

Free Application for Federal Student Aid (FAFSA): <https://studentaid.ed.gov/sa/fafsa>

College Scholarship Service Financial Aid Form (CSS Profile):
<https://cssprofile.collegeboard.org/>

The National Association of College Admission Counselors (NACAC):
www.nacacnet.org/globalassets/documents/publications/financialaid7steps.pdf

National Collegiate Athletic Association: [recruiting-fact-sheet-web.pdf](#) (nfhs.org)

College Board: <https://bigfuture.collegeboard.org/scholarship-search>

College Data: www.collegedata.com/scholarship-finder

College Board's 2021 Trends in College Pricing Report:
<https://research.collegeboard.org/pdf/trends-college-pricing-student-aid-2021.pdf>

Finaid: <http://www.finaid.org>

Fastweb: <http://www.fastweb.com>

U.S. Department of Education's Federal Student Aid website:
<https://studentaid.ed.gov/sa/types/grants-scholarships/finding-scholarships>

U.S. Department of Education's College Affordability and Transparency list:
<https://collegecost.ed.gov/affordability>

Chapter 5

Making a Decision

What You Will Learn to Do

In this chapter you will learn about the different decisions that a college or trade school might make about your application. We will also explore how you can choose from the options you have and make smart decisions. You will learn about all the factors you might consider.

Skills and Knowledge You Will Gain Along the Way

- ✓ Definitions of admission decisions.
- ✓ How to understand the impact of your choices.
- ✓ Ways to research your options.
- ✓ The role of financial aid.
- ✓ How you make the most of opportunities.



There are still many choices you will have to make after you apply for college or trade school. Courtesy of iStock, Credit fotosipsak

Awaiting Outcomes: Admit, Deny, Defer, Waitlist

Some trade schools and colleges have **open enrollment** (also known as open admission) meaning anyone can take classes. Other schools have streamlined admission processes where you immediately learn your decision when you apply. Many colleges have lengthier timelines where you will have to wait weeks or months to know if you are admitted. Usually, schools will outline the calendar for decisions on their website. Let's look at what some of these decisions could be:

New Vocabulary

open enrollment—
*anyone who registers and
pays can take classes*

- **Acceptance/Admit.** An offer of admission to a college or university.
- **Spring/January Acceptance.** An offer of admission to a college or university with a second semester start date. Often these offers include the opportunity to enroll in a college sponsored program off campus (usually abroad) to earn credit during the first semester.
- **Conditional Acceptance.** An offer of admission to a college or university that is contingent upon certain steps a candidate must take, or criteria they must fulfill, in order to ultimately enroll.
- **Denial.** An application for admission to a college or university is declined.
- **Deferral.** A delayed admission decision for candidates who apply through early application plans. Often an updated transcript/academic form and/or an update on involvement is required or recommended when a student is deferred.
- **Waitlist.** Neither an acceptance nor a denial, this means an applicant is potentially admissible but that the college will keep the student on-hold in the applicant pool for later consideration based on enrollment numbers. The student must claim a spot on the college's waitlist for later consideration—often after the National Deposit Deadline of May 1.
- **Guaranteed Transfer.** An applicant is denied admission as a first-year student but is offered the option to transfer to the college (frequently as a second-year student) provided the student earns a specified GPA at another institution.



Waiting for admission decisions can be stressful. Courtesy of iStock, Credit BrainAJackson

Weighing Your Options

You might think that waiting for your decisions to come back is the hardest part of the admission process. The reality is that often, having multiple options for your next step after high school can be even more intimidating. For many students, this is the first big decision you will have to make. Up until now, your path was mostly decided for you. By law, you had to attend school. Now your future is up to you.

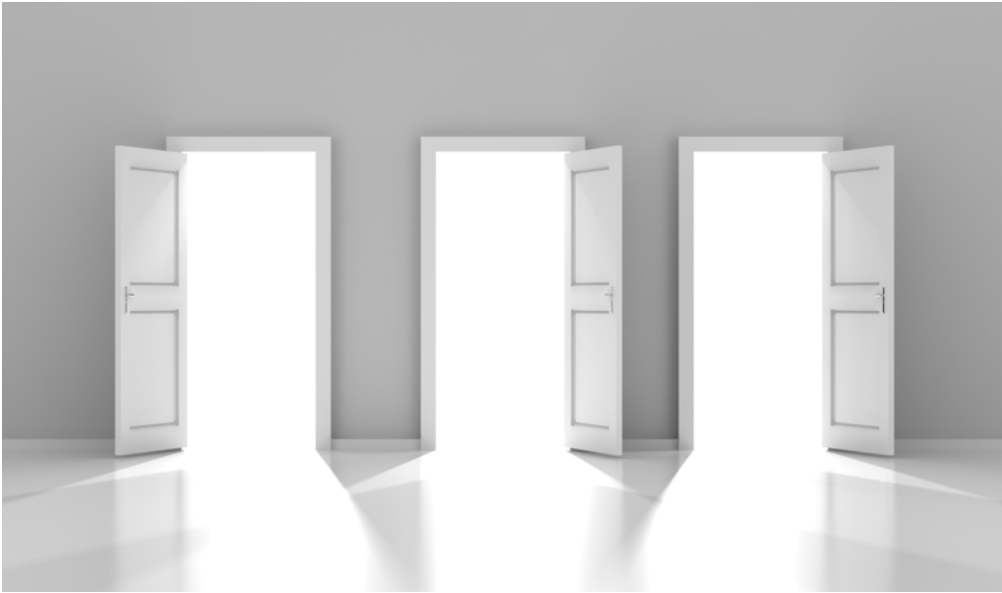


Weigh the pros and cons of your options. Courtesy of iStock, Credit IvelinRadkov

Spend some time looking back at what you learned in the first two chapters of this unit. Review all the different pathways you can take, think about the self-reflection you did, and check the goals that you set. What is important to you? How will your current circumstances, finances, and interests impact your choices? It is helpful to write down your priorities and options and then make a list of the pros and cons of each choice. Talk about your options with your parents, siblings, friends, teachers, counselor, and anyone else who supports you. Find out how they made the big decisions they have faced in life. What do they wish they did differently and what went well? Share your thought process and ask them if you are missing any factors that you might not have considered. Don't rush your decision or wait until the last possible minute to make it. Remember, whichever path you choose, you can always change direction later.

Choosing a College or Trade School

Whether you have applied to trade schools, community colleges or four-year degree programs, hopefully you have a few schools to choose from. Take a moment before you dive into decision-making to be grateful for the privilege of choice.



You might have many doors of opportunity open at different schools, but which will you choose? Courtesy of iStock, Credit vmgerman

As soon as you are admitted, you will start receiving letters, emails, texts, and other marketing materials trying to convince you to choose their school. For four-year colleges and universities, if you have been accepted through a non-binding plan for the fall semester, you have until May 1 to make your decision. That is an agreed upon date by all colleges.

Most schools will offer events, both in person and online, to visit their campus and participate in accepted student programs. Take advantage of these programs because they are a chance for you to ask questions, meet the other admitted students, and get a full picture of all the opportunities there. Talk to as many people as you can while at each school. Students, professors, staff, alumni, and people from the local area will give you a wide range of views. As you research your options further, consider some of the following areas and questions to ask others and yourself.

Will You Belong?

- Who are the types of people that challenge, support, stretch and encourage you?
- What types of individuals do you like to surround yourself with?
- Are you looking for a college experience that mirrors your home/high school or one that takes you completely outside your comfort zone and exposes you to a completely new and different culture?
- Do you want a college that has a lot of school spirit?
- Are students engaged in and out of class?
- What do students do on weekends?
- Is it a “suitcase campus” where students tend to go their separate ways when classes are done?
- How connected are the alumni? Is there a strong network that persists beyond the campus gates?
- Do you feel a sense of community, connection, and belonging on campus?
- If you are honest, do you really see yourself there?

Will You Feel Safe?

There are different types of safety. There is feeling physically safe and also feeling intellectually safe. Ask questions to help you determine if you will feel safe.

Physical Safety:

- What systems are in place for campus alerts or emergency notification? How are students made aware of crime or other incidents that occur on campus?
- What is the highest profile crime reported on campus in the past year? How does that compare to other schools you are considering, other colleges in the area, and your city or hometown?
- How safe is the neighborhood/area surrounding campus?
- What is the relationship like between the college and the town?
- What are the campus statistics for reports of dating violence, domestic violence, sexual assault and stalking? (Each school is required by law to make this information available)
- What procedures exist for institutional disciplinary action in cases of dating violence, domestic violence, sexual assault, stalking and other crimes?
- Does campus security provide a safe escort service in the evening, and if so, how accessible is it and how often is it used?

Intellectual Safety:

- What is the academic climate on campus like?
- How supportive is the community of freedom of expression (inside and outside the classroom)?
- Are students and faculty open to diverse opinions and perspectives? Do they “talk across the aisle”?
- Has the campus hosted controversial speakers and what was the community’s response?

Can You Be Successful?

- In the past, what experiences and environments have provided you with the encouragement and inspiration to grow?
- Will the culture, faculty, and fellow students at the school offer the freedom you need to be proud of your accomplishments, and to both discover and enhance your talents and abilities?
- In college, do you want to be a “big fish” in a small pond or “small fish” in a big pond?
- Do you sense this is a place you will spend your college experience feeling like you don’t measure up or is it a place that will inspire you to find confidence in your potential to excel?
- Will you grow?
- Can you identify three specific ways you are excited to make community and make your mark there?

Can You Thrive?

- Does the school have the programs you want to study, and can you easily change your mind?
- Will this school allow you to be your best self?
- As you consider options, what resources and supports exist on each campus to help you reach your goals?

- Are you interested in double majoring or pursuing a minor? If so, how flexible is the curriculum?
- Do you want the ability to go immediately into your major or do you want a school that provides breadth and depth of offerings necessary to allow for exploration?
- How accessible are opportunities for creativity?
- What are your desires for your college experience, and will your choice provide a framework for you to achieve these hopes?
- How available are internships and research opportunities?

Return on Investment

Postsecondary education is a significant investment of time and money. Is it worth it? Study after study shows that higher education increases your overall earning potential throughout your life. But how much, and is it true in all cases? *Return On Investment* (ROI) is the measurement of the difference between total earnings in the ten years post-graduation, divided by the total cost of your education. The higher the ROI, the better a financial bet the school is on average. The following factors will contribute to the return you get from your schooling:

- Total cost.
- Projected debt (if any).
- Graduation rates (4-year, 5-year, 6-year).
- **Co-op** or internship opportunities and salaries.
- Job placement rates and mid-career earnings by major.
- Loan default rates of recent graduates, ideally by major.
- Career services and job placement efforts at the college.

New Vocabulary

co-op—
combines classroom-based education with practical work experience and provides academic credit for that structured job experience



What is the value of your investment. Courtesy of iStock, Credit IvelinRadkov

The following tools will give you information you need to evaluate ROI:

- [College Navigator](#). Provides insight into a school's graduation, job placement, and student loan default rates.
- [College Scorecard](#). Provides information on how much money a school's graduates earn, the student loan debt average students carry and how many students can keep their loans in good standing.
- [Occupational Outlook Handbook](#). Provides information on different jobs, projected growth, median salaries, and necessary education.

Comparing Financial Aid Packages

Before you choose a school, you want to make sure it is affordable. If you have applied for need-based financial aid you will receive an award letter that outlines what the school is offering you in support. Even if you did not apply for aid, you might get offered a merit scholarship. Unfortunately, every school presents these award letters in different ways, so it can be difficult to know what you are comparing. Some schools list financial aid by semester and others by year. Make sure you are clear about what you are reading (comparing apples to apples) and ask their financial aid office any questions that you need to fully understand what you are looking at. Consider not just affordability, but value. If you like School A more than School B, but School B has offered you significantly more financial aid, is it worth it to save that money in the long run and attend School B? Or are you comfortable investing more in School A if you think it's a better match for you? Create a spreadsheet or list in order to assess your financial aid offers in a uniform manner, and to understand the real costs of earning a degree at each of the schools you are considering. This financial decision spreadsheet will allow you to have transparent conversations and open discussions about the implications on your family and future.

Conclusion

As you learn about the outcomes of your applications, weigh your options, and finally make a choice, make sure you lean on the support of those around you. Ask family and friends how they have made big decisions. Find out from them what worked and what didn't as they made their choice. What would they do differently looking back? Ultimately, the decisions you make about what comes next will be right for you because you are making them. Trust that and remember that you can always adapt as you need to.

Critical Thinking

New Vocabulary

co-op
open enrollment

1. What have you learned in other units and chapters in this textbook that will help you as you make decisions about your future?
2. What decision, big or small, have you made before?
3. Do you get excited about lots of choices or overwhelmed?
4. What role will finances/money play in your decisions?

Study Guide Questions

1. What is the difference between being deferred and being put on a waitlist?
2. What are three questions that you think are important for you to consider when deciding about a school?
3. What are two factors that might impact Return on Investment?
4. What is the College Scorecard?

Web Resources

College Navigator: <https://nces.ed.gov/collegenavigator/>

College Scorecard: <https://collegescorecard.ed.gov/>

Occupational Outlook Handbook: <https://www.bls.gov/ooh/home.htm>

Developing Current Skills

What You Will Learn to Do

In this chapter you will learn about the skills you need to be successful in school, work, and life. We will explore the different areas where you can focus on developing strengths and how that will help you as you move forward.

Skills and Knowledge You Will Gain Along the Way

- ✓ What 21st century skills are.
- ✓ How soft skills are different from hard skills.
- ✓ What S.T.E.A.M. is and why it is important.
- ✓ How to develop skills for success.



Having a well-rounded set of skills is crucial to be successful in school, work, and life. Courtesy iStock, Credit vicky_81

21st Century Skills: What Are They and Why They Matter

Before the year 2000, a lot of the talk about skills focused on the *content* of what people knew. As the 21st century began, the conversation shifted to not only knowledge, but also how we understand and apply what we know. These 21st century skills are the ways of learning, working, and relating that allow individuals to thrive. The exact abilities that make up the 21st century skills are a little different depending on who you talk to. Some researchers have identified four or five key skills and others have a list of ten or more. There are some common themes, which we will call the seven C's (not to be confused with the seven seas, representing the oceans of the world):

- Creativity (innovation)
- Collaboration
- Communication (expression)
- Critical thinking (problem solving)
- Curiosity
- Civic engagement (social responsibility/inter-cultural awareness)
- Character (non-cognitive attributes)



Skills, the building blocks to success. Courtesy of iStock, Credit 1001Love

The skills that fall under these categories are important because our world is rapidly changing, and we need to have the ability to change with it. How we learn and work is very different than it was ten or twenty years ago. To be successful in an increasingly global community we need these 21st century skills as a foundation.

Hard Versus Soft Skills

When we talk about hard and soft skills, we are not referring to a level of difficulty. In fact, soft skills can be as challenging (or more) to develop than hard skills. The difference between them has more to do with how measurable or specific they are.



Know the difference in skills. Courtesy of iStock, Credit designer491

Hard skills are strengths and abilities that are more easily defined and evaluated. Examples of hard skills are:

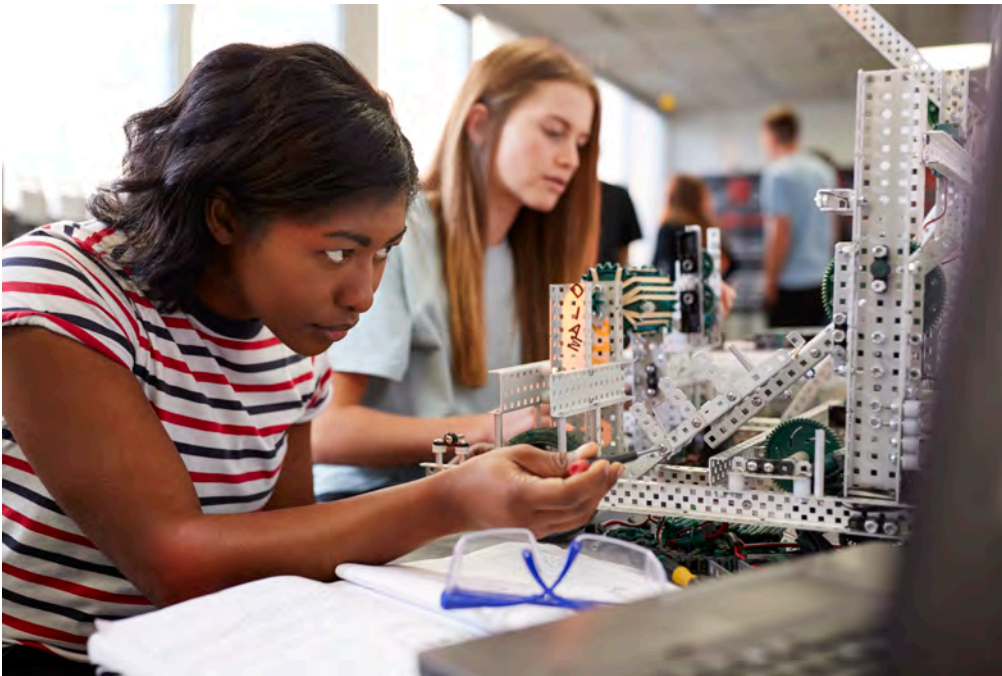
- Computer programming
- Welding
- Math
- Foreign language learning
- Automotive repair

Soft skills are strengths and abilities that are less specific and are usually not limited to one job or area. They can be attributes of your personality that you develop over time. Examples of soft skills are:

- Resilience
- Teamwork
- Communication
- Leadership
- Creativity

S.T.E.M Skills and the Future

S.T.E.M. stands for Science, Technology, Engineering, and Math. The acronym was developed to represent the importance of all these fields working together in a world that is fast becoming more digital and technology based. To be competitive internationally there is a realization that schools must provide a strong foundation in these fields and show the ways they interrelate. You may have heard this more recently called S.T.E.A.M., because the arts are increasingly recognized as an important player in this equation.



Future engineers at work. Courtesy of iStock, Credit monkeybusinessimages

From environmental solutions to information security to healthcare management, S.T.E.A.M. careers will continue to be in high demand. The job growth rates for these fields are expected to outpace many other industries and professions. There is general agreement that in the 21st century, every student should have an educational foundation in S.T.E.A.M., even if you will not be directly working in these sectors.

Skills of a Successful Student and Team Member

Everyone has a different definition of success, and it could look different for the same person in different circumstances. Success in school might be different from success at work. No matter your definition, the underlying skills that will help you achieve your goals in school and work are the 21st century abilities we have discussed in this chapter. Of course, depending on the subject in school or type of work you are doing, there are hard skills that you absolutely must learn. If you cannot conjugate a verb in your Spanish class, it will be difficult to be successful in learning that language. Likewise, if you don't know how to weld, you will not make a very good welder!



Skills for success. Courtesy of iStock, Credit alvarez

No matter what you do, soft skills—the ability to think critically, communicate, innovate, and work together—will be important. Whether you are working on a group project in your history class, constructing a house, or designing a presentation for a client, these skills will allow you to put your best foot forward and advance in your school or field.

Conclusion

Many of the jobs that will be available to you in your future have not even been created yet. While in some ways, that makes it hard to plan, the skills you develop now will benefit you in whatever you do. Be creative and curious and challenge yourself to step outside your comfort zone. That is how you grow and learn. It is how you build foundational 21st century skills that will open up opportunities.

Critical Thinking

1. Choose one of the 21st century “C” skills that you want to develop more and explain why.
2. What does success in school mean to you and what skills do you need to achieve it?
3. How has S.T.E.M education been a part of your schooling?

Study Guide Questions

1. Give an example of a 21st century skill.
2. Why are 21st century skills important?
3. What are two hard skills that you have?
4. What are two soft skills that you are strong in?
5. What is the difference between S.T.E.M and S.T.E.A.M.?

Web Resources

MIND Research Institute: <https://www.mindresearch.org/>

NASA STEM Engagement: <https://www.nasa.gov/stem>

U.S. Department of Education STEM: <https://www.ed.gov/stem>

Unit 2

Personal Finances

Personal finance is a term that covers managing your money as well as saving and investing. Personal finances can encompass banking, budgeting, loans and credit, insurance, mortgages, investments, taxes, and retirement and estate planning.

Personal finance is about meeting personal financial goals, whether it's having enough for short-term financial needs, planning for retirement, or figuring out how to pay for a college education. Coming up with a plan to fulfill those needs financial goals that fit within your financial constraints is key. To make the most of your income and savings, it's important to become financially literate, so you can distinguish between good and bad advice and make smart decisions.

Chapter 1

Making Dollars and Sense

What You Will Learn to Do

In this chapter, you will learn the importance of saving money, creating a budget, and handling a checking account. You'll soon be earning a military or living wage and you'll have important choices for how to spend it, save it, and grow it. The one thing you can count on is your income probably won't always be enough to cover everything you need at the time you need it. As a result, you need to save money today so it's available down the road when you need it.

Skills and Knowledge You Will Gain Along the Way

- ✓ Define the difference between saving and investing.
- ✓ Understand the importance of saving and the different ways to save.
- ✓ Understand how to create and stick to a budget.
- ✓ Become familiar with how to use and maintain a checking account.



You have important choices for your money—how to spend it, save it, and grow it. Courtesy of iStock, Credit Ridofranz

Saving vs. Investing

Although the terms are used interchangeably, saving and investing represent different methods of using money to prepare for the future.

Saving is the act of putting aside money in safe accounts for short-term needs or future goals, such as purchasing a car or the down payment for a house. It can also help provide a cushion in case of an emergency or an unexpected expense.

Investing, on the other hand, is using your money to buy an **asset**, like stocks, in hopes of earning a higher **return** over time. Money for long-term goals, such as saving for your child's college education or for your retirement, can often be put into investments. We will take a closer look at investing in Chapter 2.



Saving for short-term goals or unforeseen expenses. Courtesy of iStock, Credit evgenyatamanenko

Typically, money for savings is placed in accounts which are easily accessible, take little to no **risk**, and therefore, earn lower returns. The key objective for a savings tool is not the return *on* your money, but the return *of* your money when you need it.

Becoming a Saver

Regardless of your age or income, one of the hardest things about saving money is getting started. But the fact is, the sooner you start saving money, the more it will grow. Use a goal of 10–15 percent of your **gross pay**, not what you take home, as a target for how much you should be saving each month.

Example

$\$42,000 \text{ gross pay} \times 10\% = \$4,200$

$\$4,200 / 12 \text{ months} = \$350 \text{ per month savings}$

New Vocabulary

asset—
property owned by a person (or company) regarded as having value
return—
the money made or lost on an investment over some period of time

New Vocabulary

risk—
the chance of an investment declining in value

New Vocabulary

gross pay—
the amount you make before taxes or other deductions are taken out

New Vocabulary

direct deposit—
the electronic transfer of
a payment directly into
your account

Save Automatically

The best and easiest way to build savings is by putting money away automatically and consistently, even if it's small amounts. The key is to begin now. Set up **direct deposit** to take money from your pay before you ever see it and deposit it into your savings account. Or create an automatic monthly transfer from your checking account to a savings account. This will reduce the temptation to spend your money. If you don't see it, you won't spend it. Contact your employer to set up direct deposit.

Save Separately

Mixing your savings with your day-to-day money is a sure-fire way to guarantee the money doesn't stay saved. Instead, set aside your savings in separate accounts and label them—if you can—for their intended purpose. For example, you might have a car down payment account or a vacation account, just to name a few.



Set up individual accounts for different purposes. Courtesy of iStock, Credit Sasiistock

Pay Yourself First

There are numerous ways to help build up your savings even more:

- **Bank all windfalls.** Put some or all your pay raises, bonuses, tips, federal income tax refunds, gift money toward your savings goals. You might be tempted to treat yourself to something with that bonus you just received, and you should, but keep that treat small and put the majority toward your savings goals.
- **Use a round-up app.** There are several apps available that allow you to round up purchases and put the difference in your savings account. You won't even miss the change, but that change can add up quickly over time.
- **Cut your expenses.** Create a budget and ensure your expenses are less than your income. Even cut your expenses if necessary. How to properly create and stick to a budget will be discussed later in this chapter.
- **Sell things that you no longer use.** Deposit any cash you earn from selling things you no longer need or want around the house. Remove clutter and earn money at the same time. It's a win-win!

New Vocabulary

windfall—
an unexpected profit or
gain of money

- **Make more money.** One of the fastest ways to grow your savings is to grow your income. You could look for a higher paying job, pick up a part-time job or side hustle, or work overtime.

The best way to build your savings is to set a savings goal and ensure you put money in savings first before paying any other bills. Don't wait to see what is left over each month because we all know that never works. Instead, pay yourself first.

Where to Save

The types of programs used for saving can often be found at a commercial bank or credit union. These programs may often earn less interest than an investment, but that's okay because you will have the benefit of **liquidity** and lower risk. It's more important to have this money available when you need it than to earn a higher return on it. There are several traditional accounts and programs to use for saving, but not all these allow you to withdraw funds whenever needed. (For example, a Certificate of Deposit.)

New Vocabulary

liquidity—
the ease at which an asset can be converted into cash

Savings Accounts

A *savings account* is a bank account that allows you to set money aside and earn interest in the process. However, the interest rates are often quite low. Savings accounts are highly liquid, allowing you to withdraw funds whenever needed. They are also safe because your money is generally insured by the Federal Deposit Insurance Corporation (FDIC).



Note

When choosing a bank for a savings account, look for one that has a competitive interest rate, does not charge fees, and has the ability to make transfers. For convenience, you should also look for a bank that offers direct deposit, mobile check deposit, and free nationwide automated teller machines (ATMs).

Money Market Accounts

A *money market account* is like a savings account in the fact that your money earns interest and is accessible if needed. However, this type of account may also allow you to write checks. Money market accounts usually offer higher interest rates than savings accounts, but that isn't always true. The downside of money market accounts is that they sometimes have higher minimum balance requirements, and they may restrict the number of withdrawals you can make before you have to pay fees.

Certificates of Deposit (CDs)

Certificates of deposit (CDs) generally allow you to earn a higher interest rate on your money than a typical savings account or money market account. Essentially, you promise a bank that you won't withdraw the money for the term of the CD (which could be 30 days to 10 years) in exchange for earning a higher interest rate. CDs are not as liquid as other types of accounts and you may be charged a fee if you withdraw the money early.

Saving Deposit Program (SDP)

Service members deployed in designated combat zones or qualified hazardous duty areas are eligible for the *savings deposit program*. You can earn 10 percent interest

annually on money deposited into the program, and you can deposit up to \$10,000 of your pay and allowances. The account stops accruing interest 90 days after returning from your deployment region. The savings deposit program is not very liquid, but emergency withdrawals may be made when authorized by a commanding officer.

Saving for a Rainy Day (Emergency Fund)

Forty-six percent of Americans have not set aside enough money to cover expenses for three months, according to the 2019 State of the U.S. Financial Capability Study. Because life has a way of throwing us some financial curveballs from time-to-time, it's important to save for a rainy day. An emergency fund can help with unexpected events like car repairs, emergency trips home, or even repairing or replacing your smart phone.



Saving for a rainy day. Courtesy of iStock, Credit ronniechua

The first step is to start a small emergency fund of around \$500 to \$1000. This smaller goal makes it easier to reach and allows you to feel successful. But keep building the fund toward the ultimate goal of three to six months of your basic living expenses. These expenses include your mortgage/rent, loan payments, insurance costs, utility bills, food, gas, and clothing expenses. (Vanguard) Because you never know when you'll need it, this money should be kept in a safe and easily accessible account.

Creating a Monthly Budget

When you spend-spend-spend without a plan, it's easy to quickly blow through your money without saving a penny. And before you can even start saving for future goals or emergencies, you have to have money available to do it. For most people, this means creating a spending plan or budget with the goal of freeing up cash that can be used for savings. But first, you need to have an understanding of where your money currently goes. Then you can tell it where it should go.

Know your Current Situation

The closer you get to being out on your own, the more you need to be in control of your actions and your money. Ever open your wallet to pay for something and realize that you were down to your last dollar? And your first thought is "Where'd all my money go?" The easiest way to be sure of where your money goes is to track your spending by keeping a *spending log*. Track everything you spend each day. Don't forget to include debit card, credit card, digital wallet, and cash transactions. Continue that spending log for two to three months and then review it. You can bet that your findings will be an eye opener and a realization as to how even little expenses add up fast!

Know Where Your Money Should Go

In the words of Benjamin Franklin, “By failing to prepare, you are preparing to fail.” Let’s avoid failure by preparing a plan for what you should be doing with your money. That plan is called a *budget*.

The goals of a budget are to not spend more than you make and to understand where you are spending that money. Without a budget, you’ll tend to make random purchases of things you don’t really want or need. An effective budget increases your chances of success because it prioritizes how your money will be spent each month, avoids waste, and makes it easier to save for future and unexpected expenses.

Every situation is different, but there are some great budgeting principles that can help you create the best plan for your situation. One of those principles is the 50-30-20 Rule:

- 50 percent of your take-home pay should go to fixed and necessary living expenses, such as mortgage/rent, utilities, insurance, food, car payment, gasoline, etc. With no more than 10 percent going to a car payment and no more than 25 percent going to rent or a mortgage.
- 30 percent of your take-home pay should go to **discretionary spending** and fun stuff, such as eating out, entertainment, subscriptions, fitness membership, etc.
- 20 percent of your take-home pay should go to savings (saving for future goals, growing your emergency fund, etc.) and paying off credit cards.

New Vocabulary

discretionary spending—*non-necessary spending rather than spending on necessary expenses*



50-30-20 Rule Chart Courtesy of USAA

Use your spending log to see what you have spent in the past to predict what you might spend in the future. Group your expenses into categories and record a monthly amount for each category. Follow this plan of attack:

1. Record your income, and not just your paycheck. Gifts, tax refunds, rebates, proceeds from selling stuff all count.
2. Be sure to pay yourself first by funding your savings and paying off debt before anything else.
3. Fill in expenses that are essential to your survival. Not just rent, utilities, and food, but also out-of-the-ordinary expenses like new tires for your car.
4. Figure out how much discretionary money is left and fill in those non-essential expenses. Things like gifts, eating out, gym memberships, etc.
5. If possible, create a budget and savings plan that allows you to decrease your discretionary spending and increase your savings.

Some budget items are hard to plan for. Car insurance, for example, can be a *periodic expense* if you pay it twice a year. Even though it's not a monthly expense, you'll want to set aside an amount each month so that you have enough when the bill is due. Another budget item that is hard to plan for is the *occasional expense*, such as car repairs. You have no idea when they might be needed or how much they will cost. The best approach is to create an emergency fund so that you are prepared should such an occasional expense arise.

Remember, cutting back on non-essential expenses is what allows you to save more. Just be careful not to cut so much that you feel like your budget is a punishment.

How to Keep from Blowing Your Budget

Many people create budgets but don't have the discipline to stay within the plan. Here are some suggestions to keep from blowing your budget:

- **Limit your use of credit and debit cards and switch to a cash-only envelope system.** It is way too easy to pay for something using plastic when you don't actually see the money leaving your hand. With an envelope system, when your money runs out for a discretionary spending category, you're done spending.
- **Remove your saved information from internet shopping accounts.** This will make you think twice about a purchase and avoid the temptation of purchasing with a single click.
- **Choose cheaper entertainment.** Invite your friends out for a cup of coffee instead of a pricey dinner.
- **Think used instead of new.** You can save a lot of money by buying gently used clothes, video games, sporting goods, and books. Refurbished electronics are another good buy and often come with warranties.
- **Make adjustments.** Be sure to check your budget every now and then and make adjustments as your life changes.
- **Share your plan with others.** Recruit a friend or family member to hold you accountable. Knowing that someone is going to check in with you may inspire you to stick with your plan.



Budgeting envelopes. Courtesy of iStock, Credit Del Henderson Jr

Thankfully, today there's a lot of budgeting programs and apps that can make managing your money easier. Whatever budgeting method you choose, make sure it's one that is user friendly, easy for you to maintain, and free or low cost.

Using Your Checking Account

Back in section *Where to Save*, you learned about a few types of savings accounts that can help you safely stash your cash for future goals. But savings accounts don't work for everyday spending. That's where a checking account comes in.

Checking Account Fees

Free checking accounts are very common, but "free" doesn't mean totally without cost. It just means no monthly fee. Be sure you understand the fee types and amounts your bank charges. Banks must clearly disclose all fees to consumers to make it easy to comparison shop for the bank services you need. Here are a few examples of types of fees:

- **Out-of-network ATM fees.** May occur when using an ATM not owned by your bank or not in your bank's network.
- **Check fees.** May occur when writing more checks than allowed in a month.
- **Nonsufficient Funds (NSF) fees.** May occur when writing a check for an amount that exceeds your balance. NSF fees can be \$25 to \$50; a costly mistake.
- **Overdraft (OD) fees.** May occur when having an electronic transaction that exceeds your balance.

You can avoid many of these fees simply by recording your transactions in a checkbook register. This allows you to track the type and number of transactions per month. And because you always know your balance, you avoid overdraft and NSF fees.

Debit Card

A *debit card* might look like a credit card, but it is tied directly to your checking account. Debit card transactions are applied immediately to your checking account. For an extra level of assurance that the authorized owner is using the card, you must enter a *personal identification number (PIN)*.

When making a purchase at a store, you may have been asked “credit or debit?” The main difference is that by selecting *credit* the money will be taken from your checking account within a few days. Selecting *debit* takes the money instantly and also provides you with the ability to get cash back with the purchase.

Writing a Check

Checkbooks might seem obsolete in this day and age as digital payments become more common. But paper checks can still be a good tool in certain situations. While most merchants don't prefer checks, your landlord or utility company might. So, it's still important to understand how to write a check. Especially since checks are a good option to use as proof of payment rather than paying with cash.

If you make a mistake while writing a check, write “VOID” across the check and record the voided check number in your checkbook register.



Tip

Order a box of checks to have on hand when you need one. Be sure to store your checks in a safe place.

Making a Deposit

Standard in-branch bank deposits aren't your only option for depositing money into your checking or savings account. You can also do an ATM deposit or a mobile deposit. Regardless of how you deposit a check, you need to endorse it first by signing your full name on the back. To ensure your money gets to the right place, write your account number on the back as well.

- **Standard In-Branch Bank Deposit.** When making a deposit at a bank, you'll use a *deposit slip*. By providing your name and the account number you want to deposit your cash and/or checks into, your funds will be properly deposited. You can even get cash back from your deposit.
- **ATM Deposit.** Using an ATM (automated teller machine) to make a deposit is convenient because ATMs are available even when banks are closed. Insert your ATM (or debit) card, enter your PIN to access your account, and follow the on-screen prompts. Alternatively, use a mobile wallet for a no-contact ATM transaction. In all cases, wait for your receipt, and keep it in a safe place in case there's a problem with your deposit.
- **Mobile Check Deposit.** Mobile check deposits are even more convenient because you can do them with your smartphone anywhere, anytime. For most banks, access your mobile banking app on your smartphone and log into your account. Select the mobile check deposit option, and snap a clear photo of the front and the back of your check when prompted. Confirm the dollar amount and other details, such as which account to deposit into. Once the photos are accepted, your mobile deposit is made.



Tip

Do not endorse a check until you are ready to cash or deposit it, because once the check is endorsed, anyone can cash it.

Keeping a Record of Your Transactions

Each time you write a check, withdraw money from an ATM, or use your debit card, you need to keep a record of the transaction. Use a transaction register (checkbook register, spreadsheet program, mobile checkbook app) to record each transaction and keep a current, running balance. Be sure to include the date of the transaction, the person or business to whom the money is going, and the amount.

One of the most important pieces of information from the transaction register is the balance. It is an accurate and up-to-date balance of the money available. Keep in mind that your online banking app balance might not be your *actual* balance because some transactions can take several days to show up in your account. If you write a check or use your debit card and spend more than you have in your account, you can be hit with a nonsufficient funds (NSF) charge. As mentioned earlier, these NSF fees can be significant.

At the end of each month, be sure to **reconcile** your transaction register against the bank statement. Make sure there are no unexpected transactions and the balances match.

Conclusion

Once you start making dollars, use them sensibly by sticking to a budget and saving regularly. As a result, the money you save today will be available tomorrow when you need it.

Critical Thinking

1. Write down all the expenditures you can remember from the past two days. After looking at our spending log, ask yourself these questions. What do I wish I'd done with that money instead? Will it take me longer to reach my financial goals now? What can I do to keep from making that same mistake again?
2. Given the 10-15% of gross income target, how much should you be saving each month?
3. What can you do to save more money if you need to?
4. What goals do you have for which you might set up separate accounts?
5. Think of a time where you had an unexpected expense where having an emergency fund would have made the situation easier.
6. Visit the website of a commercial bank or credit union in your community. List the minimum balance requirements for checking and savings accounts. What is the current interest rate earned on savings?

New Vocabulary

reconcile—
to compare two sets of financial records to verify that figures are correct and in agreement

New Vocabulary

asset
direct deposit
discretionary spending
gross pay
liquidity
reconcile
return
risk
windfall

Study Guide Questions

1. Your take-home pay is \$3,400 per month. Based on this information, answer the following questions:
 - (A) How much should go toward clothes, entertainment, eating out, and other fun stuff?
 - (B) What percentage should go toward savings and paying off debt?
 - (C) How much should go toward required living expenses, such as rent, insurance, food, car, and gasoline?
 - (D) How much, at most, should you pay for rent?
2. How much money should you have in a fully funded emergency account?
3. What are the two main goals of a budget?
4. When creating a budget, how much of your take-home pay should go to fixed and necessary living expenses, such as rent, utilities, insurance, food, car payment, etc.?
5. If you want to get cash back while using your debit card, does the transaction need to be *credit* or *debit*?

Investing for Your Future

What You Will Learn to Do

This chapter will introduce you to the basics of investing. Even if you have a trusted professional money manager you should still understand key investment concepts. It's your money; you need to know what it's doing and be comfortable with it.

Skills and Knowledge You Will Gain Along the Way

- ✓ Provide an understanding of return and risk.
- ✓ Identify the various types of investment vehicles.
- ✓ Understand the important benefits of compound interest.



The earlier you begin to invest, the more wealth you can accumulate with time. Courtesy of iStock, Credit RomoloTavani

When to Invest

If you recall, the difference between saving and investing is that you *save* for short-term needs or goals while you *invest* for long-term goals and to build wealth. Saving money and paying down debt should almost always come before investing money. It is important to have savings for future goals and an emergency fund in place before growing your wealth through investing. If you have debt with high interest rates, it may make more sense to use your money to pay that debt down first before investing. Also, having a budget in place gives you a plan for how much you can save and/or invest.



Note

Do not invest your emergency fund since you may need to access those funds quickly. Investments are more for building wealth and long-term savings goals.

The key to investing is to start early. The earlier you begin to invest, the more wealth you can accumulate with time.

Understanding Return

New Vocabulary

rate of return—
is the net gain or loss of an investment over a specified time period

Return on investment, also called the **rate of return**, measures the ability of an investment to generate income or growth in value. It is expressed as a percentage of the investment's initial cost. The calculation of the return on investment is a two-step process:

1. Subtract the cost of an investment from its current value—which could be its sale price or its value after adding interest.
2. Divide the result by the cost of the investment.

The formula looks like this:

(Current value of investment - Cost of investment) ÷ Cost of investment = Rate of return

Example

You purchase 10 shares of a stock at \$23 per share for a total of \$230. After some period of time, the sale price for that stock has increased to \$26.50 per share. If you sold at this price, your rate of return would be 15%.

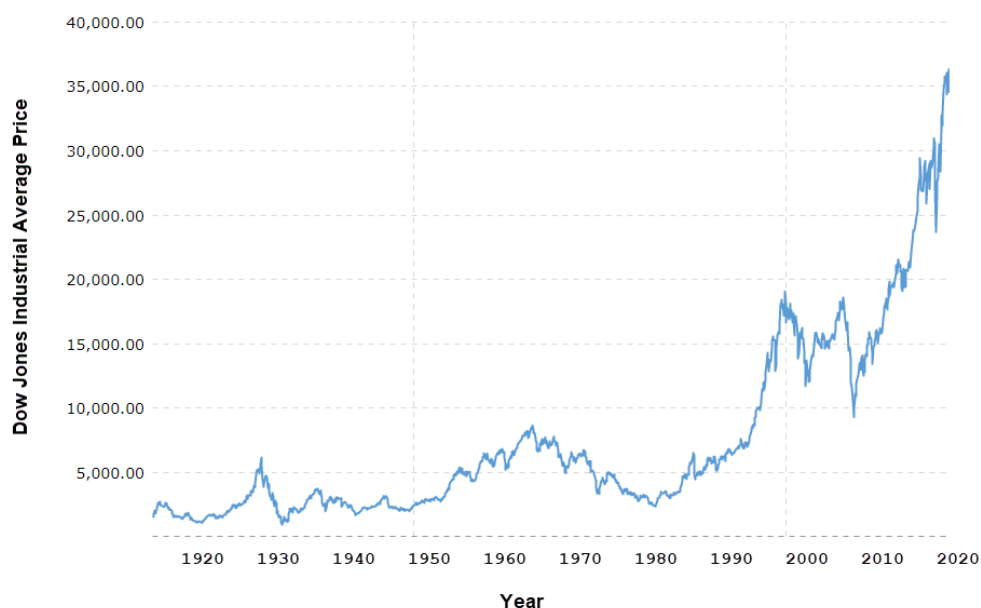
$$(265 - 230) = 35$$

$$35 \div 230 = 0.15 \text{ (or 15\%)}$$

Understanding Risk

Risk is the chance of investments declining in value rather than growing. Risk and return are typically connected in the investment world. Investments that offer the potential for greater returns tend to be riskier than those offering less potential. At the same time, taking more risk does not guarantee greater rates of return. Being too safe (or *conservative*) with your investments can also threaten your odds of success.

The rise and fall of stock prices in the short term are part of the risk of investing in stocks and mutual funds. These types of investments should be made with a long-term perspective of five years or more. That way, you potentially have time to recover losses. Even though there have been many ups and downs, the long-term movement of the market historically has been in an upward direction.



Dow Jones Industrial Average stock market index for the last 100 years shows the overall upward movement of the market. Courtesy of macro trends.net

Be sure you understand and are comfortable with the level of investment risk you are taking, and be prepared to stay invested for the long haul. Backing out later because you got nervous rarely works out well. Here is a good rule of thumb regarding **risk tolerance**: When you are in your 20s, you can take more risks with your money because you have time for the market to recover. But as you get older, say in your 60s, you should consider being more conservative in your investments, since time is not on your side.

New Vocabulary

risk tolerance—
the degree of variability that an investor is willing to withstand

Investment Vehicles

For most new investors, there are five main options for investments: individual stocks, mutual funds, exchange-traded funds (ETFs), treasury bills (T-Bills), and savings bonds.

Stocks

Companies sell *stock* to raise money to run their business. When you buy stock (**shares**), you become a shareholder and own part of the company. As a shareholder you can share in the company's profits if it chooses to distribute periodic payments called *dividends*. Individual stocks are tied to the performance of that company. Although stocks can come with big rewards, they can also lose value if the company is affected by negative circumstances, such as scandals, product recalls, technology changes, etc. The goal when buying stock is to hold it for a time, then sell it for more than you paid for it. Investing in stocks takes the most research and understanding to find the right opportunities.

New Vocabulary

shares—
a percentage of ownership in a company or a financial asset

New Vocabulary

securities—
financial investments with some monetary value

Mutual Funds

Mutual funds are an investment vehicle made up of a pool of money collected from many investors used to invest in stocks, bonds, and other assets. The collection of these investments reduces the overall risk to the investor by spreading the risk across the variety of investments in the fund. Mutual funds are available in a variety of different investment approaches and objectives.

As a tradeoff, investors are required to pay a fee for its management. Mutual funds managers decide which **securities** to buy and sell within the fund and when to do so. So before buying a mutual fund, check the fund's management fees and operating expenses. Even with the management fee, Mutual Funds can still be a great long-term strategy.

Exchange-traded Funds (ETFs)

Exchange-traded funds are a cross between individual stocks and mutual funds. ETFs trade like individual stocks (can be bought and sold at market rates) but are composed of a number of investment vehicles (like mutual funds are) and may come with management fees.

Treasury Bills and Savings Bonds

Treasury bills (T-Bills) and *savings bonds* are issued and fully backed by the federal government and are considered to be among the safest investments you can make. The earnings are **exempt** from state and local income taxes, but not federal income taxes.



Note

Using the money from a T-bill or savings bond for higher education may keep you from paying federal income tax on your interest.

T-Bills and savings bonds are purchased at a discount and the only interest payment to you occurs at **maturity**. At that time, you are paid the **face value** of the bill or bond. The difference between the purchase price and the face value is your interest. Savings bonds have a maturity of 20 to 30 years, while T-bills have a shorter maturity of two years or less. Either case, it is best to hold T-Bills and savings bonds to full maturity. If you redeem them early, you may have to pay an interest penalty. The interest rates on treasuries are generally low, but they offer very low risk. Typically, the longer the maturity, the higher the rate of return.

Basic Investment Strategies

There are numerous ways to approach investing. How you invest depends on many personal factors, such as your age, risk tolerance, and financial goals. The strategy you choose may influence everything from what types of assets you have (**diversification**) to how you approach buying and selling those assets (dollar cost averaging). The best investment strategies minimize risk and meet your goals.

New Vocabulary

diversification—
the act of investing in a variety of different industries, areas, and financial instruments

Diversification

Diversification is a time-trusted investment strategy where you select a variety of investment types for your **portfolio** to minimize risk. Instead of putting all your eggs in one basket—or one stock—you are spreading the chance of success or failure over many securities and thereby limiting risk. Some experts suggest that diversification can reduce the total risk of investing by more than half.



Don't put all your investment eggs in one basket. Courtesy of iStock, Credit Bet_Noire

New Vocabulary

portfolio—collection of financial investments, such as stocks, bonds, mutual funds, and cash

Invest Regularly (Dollar Cost Averaging)

Rather than trying to pick the *right* time to buy or sell, many investors employ *dollar cost averaging* instead. This approach involves investing in stocks or mutual funds on a regular basis regardless of changing price levels. If you invested using the dollar cost averaging strategy, you will have purchased shares at many different prices. When prices are high, your money buys fewer shares. When prices are low, your money buys more shares. Overall, the price per share averages out over the entire purchase time, spreading your investment risk over time.



Note

The same is true for withdrawing money from the market. Selling a certain dollar amount of your investments on a regular basis over time allows the selling price per share to average out.

Understanding Interest Earned

Interest earned is the money you are paid when lending money, either through investments or savings accounts. The amount is calculated as a percentage of the loan (investment) and can be either simple or compound.

Simple Interest vs. Compound Interest

Simple interest is calculated only on the principal, or original, amount of a loan. It's calculated generally for a single period, such as 30 or 60 days. The formula for calculating simple interest is:

Interest = $P \times R \times T$, where: P = principal, R = interest rate, T = term of the loan

For example, if you invest \$1,000 in an investment that earns 10 percent per year, your earned interest that year will be \$100.

Compound interest is calculated on the principal, plus all interest previously earned. The interest payments are reinvested, allowing you to earn interest on your interest. The compounding can occur daily, weekly, monthly, quarterly, or annually. The more often interest compounds, the greater your earnings.

As you would expect, compound interest results are greater than simple interest results. Compound interest is so important because when you're young, you have years and years to let the compounding work its magic.



Tip

Invest in your employer-paid retirement plan. Many employers even match the amount of money you invest; that's basically free money! (You will learn more about this in Chapter 8: Financial Planning and Retirement.)

The Rule of 72

The Rule of 72 is a simple way to determine how long an investment will take to double given a fixed annual rate of interest. By dividing 72 by the annual rate of return, you can get a rough estimate of how many years it will take of your initial investment to double.

For example: If you earn a 10 percent rate of return, your money doubles in approximately 7.2 years. However, if you earn 2 percent more, your money will double in six years. A small increase in the rate of investment return can mean a significant increase in your money over time.

RULE OF 72

$$\frac{72}{\% \text{ RATE}} = \text{Years until your money doubles}$$

EXAMPLE:

$$\frac{72}{10\%} = 7.2 \text{ Years}$$

Age 22 to 67 = 45 Years

$$\frac{45}{7.2} = \text{Doubles } 6.25 \text{ times}$$

A 10% return takes just over seven years to double your money. Courtesy of MilSpouse Money Mission

Conclusion

Investing involves risk; as a general rule, the more risk you take, the more you should be rewarded for it. Take time to understand various investment options and how they work.

Critical Thinking

Think about your current situation and consider these questions about investing:

1. Is my primary investment goal to keep my money safe or grow my investment?
2. What is my risk tolerance?
3. Is my investing time frame long enough?
4. Will I need access to my money, or can it remain untouched and potentially yield a higher return?
5. What fees will I be charged for my investment?

New Vocabulary

diversification
exempt
face value
maturity
portfolio
rate of return
risk tolerance
securities
shares

Study Guide Questions

1. If your investment receives a rate of return of 12%, how long will it take for your money to double?
2. List the two investment strategies discussed and describe each.
3. List at least three investment vehicles.
4. What is meant by the *face value* of a T-Bill or Savings Bond?
5. What would be the rate of return if you purchased 10 shares of a stock at \$44 per share and then sold them for \$55 per share?

Web Resources

Investment Return Calculator:

<https://www.nerdwallet.com/banking/calculator/compound-interest-calculator>

Rule of 72 Calculator: <http://www.moneychimp.com/features/rule72.htm>

How to Start Investing: <https://www.nerdwallet.com/article/investing/how-to-start-investing>

Your First Big-ticket Purchase

What You Will Learn to Do

This chapter will prepare you for making that first major purchase, whether it is a car, a house, or a new computer. Anything could be considered a major purchase depending on your financial situation at the time you make it. There are many factors to consider in addition to “How much can I afford?” and “Where am I getting the money from?” Just because you have to spend a lot of money on something doesn’t mean you have to risk your financial future in the process. It is possible to spend a lot and still be smart about it.

Skills and Knowledge You Will Gain Along the Way

- ✓ Consider whether to use cash, credit, or a loan for major purchase.
- ✓ Understand how much you can afford to spend on this purchase.
- ✓ Understand what this purchase will actually cost you.
- ✓ Become familiar with all the decision factors that go along with buying a vehicle or house.
- ✓ Understand the real cost of financing that big-ticket item.



Be smart about making your first major purchase. Courtesy of iStock, Credit HASLOO

Making Major Purchases

Big-ticket items can come up at any time of the year. Some we can predict and plan for and others we don't see coming. For those unexpected expenses, experts recommend having a separate savings account to cover emergencies. For those expensive items we do anticipate, it's best to be prepared and have a plan to avoid unwanted stress and debt. Be sure to know your financial situation and never make a major purchase on a whim!

Understanding Loans

While loans can be great financial tools when used properly, they can also be great sources of stress. Loans can be in the form of using a credit card, a bank loan or line of credit, an auto loan, or a mortgage. You should familiar with some key terms and understand how loans work before you borrow money from eager lenders:

- **Principal.** This is the original amount of money that you're borrowing from a lender—and agree to pay back.
- **Interest rate.** This is the percentage rate the lender charges you to borrow money. The higher the rate, the more interest you will have to pay.
- **Term.** This is the time frame in which a loan must be repaid. Longer terms mean more payments, more interest to pay, and typically higher interest rates.

When you borrow, you have to pay back the amount you borrowed plus interest, which is usually spread over the term of the loan. You can get a loan for the same amount from different lenders, but if the interest rate and/or term vary, you'll be paying a different amount of total interest.

In addition to interest, you may have to pay fees a loan. The types of fees can vary, depending on the lender. Some examples are an application fee for approving a loan, a processing fee for administering a loan, or a prepayment fee if you pay a loan off early. Make sure you understand all the associated fees with a loan.



Understand how loans work before you borrow money from eager lenders. Courtesy iStock, Credit utah778

Shopping for a Loan

Before you take on a loan, stop and consider whether you need to make this purchase right now or can you save for it. If your major purchase is going to require that you take a loan, here are some key tips for shopping for a loan:

- Don't be tempted to stretch out a loan term just to keep the payment lower. Because the longer you take to pay, the more you pay.
- Always inquire about any fees so that you know the total cost of the loan.
- Watch out for short-term, high-cost **payday loans** or any scheme that offers cash now in return for the borrowed amount, plus a fee.

So how much will you pay in interest for a typical loan? As we learned in Chapter 2, the formula for a simple interest rate loan is:

Interest = $P \times R \times T$, where: P = principle, R = interest rate, T = time (number of years)

New Vocabulary

payday loan—
a short-term, high-cost
loan that is typically
repaid on the borrower's
next payday, plus fees

Example

A \$1,000 loan at 15% for 2 years = \$300 in interest. That's an additional \$300 you paid to borrow that money, and that doesn't include any potential fees!



Tip

If you are going to take a loan, it's best to look for loans with low interest rates and no (or minimal) fees. Try to choose a loan that allows you to pay off the balance early without penalties or fees.

Buying a Vehicle

Buying a car can be the most exciting experience for any teen! It can also be a big decision, one that could factor significantly into your monthly budget. So, before you get too carried away comparing the horsepower, sound systems, colors, or even safety features, stop and think! It's good to get your facts and your priorities straight before you start shopping for any vehicle.



Buying a vehicle can impact your finances for the next 5–10 years, so it's important to get it right. Courtesy of iStock, Credit Oleksandra Polishchuk

Buy vs. Lease

Here's another scenario to consider; maybe a lease is the better option for your budget and lifestyle. With a lease, you typically enjoy lower monthly payments, which may allow you to drive a more expensive vehicle than buying. You have fewer repair costs since there is a factory warranty. And possibly the biggest perk—you don't have to worry about reselling it.

Sounds great! So, what's the downside? Leases typically require good credit and there is the potential of a lease ending up being more expensive than buying in the long run. When you're leasing a vehicle, you don't own it. Most leases will impose a charge per mile over the allotted mileage limit, and if you are not careful, this charge

could be substantial. You may also get charged for wear and tear, scratches, and other damages. When your lease is up, you can either purchase, trade, or return the vehicle. In any scenario, you'll probably be looking at another cycle of payments to keep you on the road. For this reason, a lease could be more expensive over the long term.

New or Used?

When it's time to buy a vehicle, many make the mistake of thinking it has to be new. While new vehicles certainly have their benefits, those benefits can be expensive. Avoiding this extra cost is why used vehicles often make more financial sense for young people with tight budgets.

	New Vehicle	Used Vehicle
Price	Higher purchase price	Lower purchase price
Loan Rates	Lower loan rate	Possibly a higher loan rate
Warranty	Full warranty, so you don't have to worry about repairs for the first few years	Limited or no warranty, so consider unexpected maintenance and repair costs
Registration, Licensing, and Insurance	Higher registration, licensing, and insurance (based on price)	Lower registration, licensing, and insurance (based on price)
Safety Features	Latest safety features and technology	May not have the latest safety feature and technology



Tip

Consider a car that is coming off a lease. The benefit is that you have an almost new car, potentially with some manufacturer's warranty remaining, and is a lower price than a new car purchase.

How Much Can I Afford?

Even if you think you can afford to spend a large percentage of your pay on a vehicle, it's probably not a good idea. Resist the urge. A lot can change over a few years, so it is important to think about your purchase not only in terms of whether you can afford the vehicle today, but also whether you'll be able to afford it in the future. Most vehicles decline in value rather quickly, making it easy to owe more than the vehicle is worth.

A good rule of thumb is to limit total transportation costs to 10–15 percent of your gross pay. In addition to your car payment, your total transportation costs consist of gas, insurance, maintenance, repairs, etc. The car payment portion alone should be no more than 10 percent. Once you've determined the monthly payment you can afford, you can then determine how much you can spend on a car. Keep in mind that spending less is typically better than spending more.

For Example:

Sara's gross pay per month is \$3,000.

$\$3,000 \times 15\% = \450 for total transportation costs. (At most, \$300 for car payment and \$150 for other car expenses per month.)

Sara plans to finance for 4 years at the current interest rate of 4%. This would allow for a \$12,000 loan amount.

But since Sara budgeted and prepared for this purchase, she has saved \$2,000 for a down payment. Now Sara knows that she can shop for vehicles priced around \$14,000.

Making the Deal

Once you've determined how much you can afford and have narrowed your choices to a specific model or two, it's time to negotiate. Negotiating can be a daunting task, but these tips can help you to get the car you want at the price you want to pay.

Here are some tasks to do before setting foot in a dealership or superstore:

- Review your credit report and credit score. That way, you can correct any errors on the credit report that could negatively affect you and correct behaviors if you need to increase your credit score. Many first-time vehicle buyers have little credit history and may need a **cosigner** or a substantial down payment. Knowing your credit score can provide you with a solid idea of what to expect when it's time to finance your purchase. (You will learn more about credit reports and credit scores in Chapter 4.)
- Get preapproved to buy a vehicle through your bank or credit union. This will give you strength in negotiating dealership financing rates.
- If you have a trade-in, know the value. You can research the value of your trade-in online using Kelley Blue Book at <https://www.kbb.com/> and provide the year, miles, and condition.
- Research competitor's pricing and factory invoice pricing (the actual cost to the dealer for that vehicle).
- Get a quote on auto insurance for specific make, model, and year of the vehicle you are interested in.

When you are at the dealership, it's important to not be drawn into a conversation about monthly payments. Those can vary depending on the term of the loan. Instead, focus on the base price you are willing to pay for the vehicle. And most importantly, be prepared to walk away if the negotiations become uncomfortable. If you are uncomfortable, come back another day, or maybe even go to a different dealership.

The Cost of Financing/Vehicle Loans

Saving up and paying cash for a car is always best, but sometimes that is not feasible. If you must take a loan, it's important to understand the total cost of financing.

New Vocabulary

cosigner—
a person who pledges to pay back the loan if you do not

APR—stands for annual percentage rate and is the yearly rate charged for a loan

When you finance a vehicle or take out a vehicle loan (or any loan for that matter) you have to pay back the amount borrowed plus interest (**APR**) and possibly fees. The combination of the APR and the term affects the total amount on interest you will pay. Longer-term loans have lower monthly payments (which make them look attractive), but generally have higher interest rates causing you to pay more interest over time.

Check out the table below for some scenarios.

Loan Comparison				
Loan Amount	APR %	Term	Monthly Payment	Total Interest
\$14,000	6%	48 mos	\$328.79	\$1,781.94
\$14,000	6%	60 mos	\$270.66	\$2,239.55
\$14,000	4%	48 mos	\$316.11	\$1,173.12
\$12,000*	6%	48 mos	\$281.82	\$1,527.38

*\$2,000 down payment calculator.net

The results of differing loan amounts, APRs, and terms. Courtesy of Calculator.net



Tip

It's usually not a good idea to take out an auto loan longer than five years. The longer you finance, the more it's going to cost you.

An important, but often forgotten, piece of information is whether there is a prepayment penalty for the loan. If your loan allows it—and you can afford it—make extra payments toward the principal to pay the loan off sooner. This can save you a significant amount of money in interest.

Protecting Your Purchase

Whether you purchase a vehicle using a loan, a lease, or cash, most states require you to carry some kind of insurance. This insurance protects your vehicle, as well as yourself, in the event of theft or an accident. You will learn more about auto insurance in Chapter 6.

Another way to protect your purchase is through an *extended warranty*. These warranties augment a manufacturer's warranty. An extended warranty is typically three to four years or up to a certain number of miles and can be on the entire vehicle or on individual parts and systems. Talk to your financial institution about any extended warranties offered or research other options.

Buying a House

A home is more than a dwelling. It's also a major financial commitment. For most people, rent or a mortgage payment is their largest monthly expenditure. Before making any decisions regarding a house, take an objective look at your current—and near future—financial situation. Consider whether buying or renting is right for you at this point in your life and figure out how much you can afford.

Rent vs. Buy



Whether renting or buying, a house can be a home. Courtesy of iStock, Credit monkeybusinessimages

Many people dream of owning their own home, but renting might actually be the better approach in certain situations. Since home values don't always go up, homeownership should generally be thought of as a long-term proposition. Don't forget to consider all the unexpected—and potentially large—expenses that go along with homeownership. Unless, or until, your financial and living situation is pretty solid, you might be better off waiting to buy a home

On the upside, homeownership does offer many potential benefits. Owning a home is a great way to build equity. *Equity* is the difference between the value of a house and the amount owed on it. This means equity increases (or builds) if the home's value increases, the mortgage balance is paid down, or both. There are also potential tax advantages to owning a home. There's a lot to be said for the sense of community and stability that can come from owning a home.

How Much House Can You Afford?

New Vocabulary

closing costs—*expenses involved for the paperwork and process to officially take ownership*

The financial aspects of homeownership involve more than a down payment, **closing costs**, and a monthly mortgage payment. In fact, those are just the tip of the iceberg. You'll also have the financial responsibility for insurance, taxes, utilities, homeowner association dues, furnishings, landscaping, home maintenance, and other unexpected expenses. People sometimes make the mistake of taking on too large of a rent or mortgage payment and end up struggling to pay their bills. You should strive to keep your monthly rent or mortgage payment below 25 percent of your gross monthly income. This way, you have money left to budget toward other goals, including those unexpected homeownership expenses.

If you prefer to think in terms of your net pay (take-home pay), strive to keep your monthly mortgage payment below 28 percent of net pay. And that payment includes property taxes and insurance on top of the mortgage.

CAN YOU AFFORD THIS?

Best to stay below 28% of net pay:

1. Take your total housing payment (rent, mortgage, condo fees, etc.).
2. Divide that by your total monthly net income.

EXAMPLE

Housing cost equals \$950/mo and your total take-home pay is \$3,890/mo.

$$\begin{array}{r} \$ 950 \\ \div \$3,890 \\ \hline .24 \text{ or } 24\% \end{array}$$

Upfront Money

Regardless of whether you are renting or buying, there is money that you must have available upfront.

Renting: Most landlords ask for a security deposit in advance. And it's not unusual for the landlord to require you to pay the first and last month's rent before you move in.

Buying: Financing the purchase of a house, townhome, or condominium will typically require closing costs and a down payment. Depending on the type of financing you obtain, be prepared to put down anywhere from 3.5–20% of the purchase price. The more you can put down, the lower your mortgage payments will be.

Before You Start Shopping for a Home

There are a number of things that you should work on months or even years before you start looking for a home. By doing these, you will reduce some of the stress that goes along with buying a house and make it a successful financial transaction.

Before you start shopping:

- Build a good credit reputation. (You will learn more about credit in *Chapter 4: Give Yourself Some Credit*.)
- Reduce other debts, especially those with high interest rates.
- Have an emergency fund in place, targeting three to six months of expenses. When owning a home, you will run into unexpected expenses, and having an emergency fund in place can help keep you out of debt.
- Save for a down payment. Even if you can get a mortgage without one, providing a down payment can reduce your monthly mortgage payments, allowing you to budget toward other goals.

Prequalification

It's a good idea to get prequalified or preapproved before you start shopping for a house. Doing so helps you stay focused on homes that fit your budget. Plus, being prequalified or preapproved shows the seller that you are a serious buyer and that you are likely to get funding. But be careful. A lender may preapprove you for more than you have requested. As tempting as it might be to go for a higher priced house, consider the impact on your budget and on other financial goals you are trying to achieve. Just because you can buy it, doesn't mean you should.

Shopping for a Home

To ensure you start on the right foot, shopping for a home should involve some prioritizing. Start by listing what you would like your house to have. Go room by room and write down the features you must have, as well as the features which would be nice to have but are not essential. For example, you might absolutely need three bedrooms to accommodate your family and would love to have a fireplace in the master bedroom, but you would still consider a house without that fireplace. It's helpful to also identify any features that you don't want the house to have.



Relying on the expertise of a realtor can help make your selling and/or buying process easier. Courtesy of iStock, Credit ablokhin

Once you have your list of feature priorities, check out some house hunting websites, such as Rocket Homes or Zillow. These sites can give you a look at how much the average home with your must-have features sells for and provide a more realistic idea of what type of home you can afford. If you need assistance with the home buying process, consider connecting with a reliable real estate agent. They can work with you to get the most out of your budget and show you more homes than you'll be able to view on your own. While house hunting, you may realize that your wants and needs don't match with your budget. Just remember to keep your options open.

Ready to Buy. What's Next?

After many open houses, you finally found the house that's right for you and you're ready to buy. What's next? There are several steps that need to take place before you can move into your new home, including putting down earnest money, getting a home inspection, and securing your financing.

Earnest Money

Once you and the seller have agreed upon a price, a deposit is required that shows your offer is in good faith. This deposit is also called *earnest money*. The amount varies, but the deposit is generally held in **escrow** until closing. At closing, the earnest money is applied to your down payment. If you fail to purchase the home without an acceptable reason, you may forfeit your earnest money.

Home Inspection

No matter how nice a home looks at first glance, there may be underlying problems with the construction, foundation, wiring, and more. The inspection is meant to protect the buyer by uncovering any hidden structural or mechanical defects. If the property needs repairs to fix any uncovered issues, the seller either makes the necessary repairs or compensates the buyer in some way—such as lowering the sale price. Cosmetic problems, such as scratched floors or chipped tiles, do not require repair. Generally, it's the buyer's responsibility to select and pay for the inspection. Be sure to schedule the inspection early enough so that if repairs are required, the seller has time to make them before the closing.

Financing

The next step is to secure your financing, or *mortgage*. Hopefully you already have a loan commitment from a lender, but if you don't, then that is your next step. Your purchase offer will probably be contingent on loan approval within a specified amount of time. Continue reading on to learn more about mortgages.

Understanding Mortgages

There is often more to a mortgage payment than just principal and interest. In many cases, your payment will also include a portion for taxes and property insurance. It might also include private mortgage insurance. Let's take a closer look at the possible parts of a mortgage payment:

- **Principal.** The amount of money you're borrowing and need to repay as part of your mortgage contract.
- **Interest.** Your cost for borrowing. The lower your interest rate, the lower your monthly payment, all else being equal.
- **Escrow.** Depending on your mortgage contract, your monthly payment could also bundle in your property taxes and homeowners insurance costs. If so, the lender holds these funds in *escrow* (a separate account) and pays the local property tax office and your insurance company when those bills are due.
- **Private mortgage insurance (PMI).** If you don't make a large enough down payment (typically 20 percent or more of the purchase price), you may be required to purchase private mortgage insurance from the lender. This protects the lender if you are unable to repay the loan. By budgeting and saving for at least a 20 percent down payment, you can avoid having to pay extra every month for PMI.

New Vocabulary

escrow—
a legal arrangement in which a third party temporarily holds sums of money in a separate account until needed

- **Closing costs.** When buying or selling a home, there are certain fees associated with the transaction. Some examples of the fees you could incur at closing include attorney fees, property appraisal, survey fees, and more. On average, buyers pay roughly \$3,700 in closing costs.

Now that you understand what makes up a mortgage payment, you can choose a loan that is right for you.

Choosing the Right Loan

There are several types of mortgages available with different kinds of rates and terms. Choosing the right loan can be tricky. The two main kinds of rates are fixed-rate loans and adjustable-rate mortgages:

- *Fixed-rate loans* (also known as *conventional loans*) are generally repayable in 15 or 30 years. Because the interest rate remains constant (fixed), your principal and interest payments remain the same for the life of the loan, which makes it easier to budget. Your monthly payment can change, however, due to increases in property taxes.
- *Adjustable-rate mortgages* (ARM) typically offer a low, fixed interest rate for a set number of years, after which the rate can increase or decrease depending on the interest rate environment at that time. This potential increase in rate can increase your monthly mortgage payment as well. It's important to understand that while there might be upfront benefits to an ARM loan, the possibility of increasing interest rates could bring higher payments in future years.

Government-backed Loans

There are several types of government-backed mortgage loans that are great options for first-time buyers, low-income borrowers, and those with less-than-stellar credit. While these loans offer an affordable alternative to conventional loans, many have eligibility requirements. Some examples of government-backed loans are:

- VA loans, backed by the Department of Veteran Affairs, are only available to those who have served our country, not to the general public. This includes active-duty members, veterans, or a surviving spouse.
- FHA loans, backed by the Federal Housing Administration, have a requirement of the home being your primary residence and typically need a credit score of at least 580 to qualify. (See Chapter 4 for information on credit scores.)
- Loans from the U.S. Department of Agriculture (USDA) to help low-to-moderate income people buy, repair, or renovate a home in rural areas only.

The decision to obtain a government-backed loan, a conventional loan, or an ARM all comes down to what makes the most sense for you. Which is why it's so important to shop around and compare loan options before making a decision.

Reducing Mortgage Costs

Even after agreeing to the terms of your mortgage, you can still save money with it. A great way to do this is to pay off the loan sooner than expected and reduce the total amount of interest in the end. You can pay off your mortgage early by:

- Making an additional lump sum payment toward the principal every year.
- Increasing your monthly payment by a fixed amount.

- Putting additional funds toward your principal balance as the opportunity arises (for example, if you receive a bonus or inherit some money).

Homeowners Insurance

Congratulations! You are now a homeowner. Don't forget to protect this major investment you just made. Homeowners insurance can help alleviate the financial burden of having your home or possessions destroyed or stolen. You will learn more about homeowners insurance in Chapter 6.

Critical Thinking

1. Most auto loans calculate interest using amortization. But for our purposes, let's calculate using simple interest:

Interest = $P \times R \times T$, where: P = principal, R = interest rate (APR), T = time (number of years)

You found the truck that you would like to buy, but you would have to get a loan for \$10,000. At first glance, which of the three options below do you think is a better deal? Use the formula above and calculate each to see if you were right.

- a) 7% APR payable in two years
 - b) 5.5% APR payable in three years
 - c) 4.75 APR payable in four years
2. Based on your current take-home pay, what is the approximate cost of a car you can afford to buy? (If you don't have a job, assume your take-home pay is \$3400 per month.)
 3. What features of a house would be on your must-have list? Check out a house hunting app and find a house in your area with these features. What is the selling price? Would this house fit into your budget? (In other words, would the monthly mortgage payment be less than 28 percent of your take-home monthly income?)
 4. Besides your mortgage payment, what additional costs would come with owning a home?

New Vocabulary

APR
closing cost
cosigner
escrow
payday loan

Study Guide Questions

1. When dealing with a loan, what is the "principal?"
2. What does APR stand for?
3. What are two advantages and two disadvantages of leasing a vehicle?
4. Does a new vehicle or a used vehicle typically cost less to insure?
5. What is equity?
6. What percentage of your take-home monthly income should you try to keep your monthly rent or mortgage payment below?

7. What is another name for the deposit required that shows your house buying offer is in good faith?
8. Your monthly mortgage payment also bundles in your property taxes for the lender to pay when due. What is the account called where the lender holds this money?
9. In what situation are you required to purchase private mortgage insurance from the lender?
10. When buying a home, there are certain fees associated with the transaction. What are those fees called?

Web Resources

Edmunds Auto Loan Calculator: <https://www.edmunds.com/calculators/simplified-pricing.html>

Mortgage Calculator: <https://www.mortgagecalculator.org>

Give Yourself Some Credit

What You Will Learn to Do

Even though paying in cash is best, as a financial tool, borrowing and using credit wisely can help build your credit reputation. However, using credit unwisely can put you into debt. Carrying debt can be a huge factor in many American households. According to the findings from the 2108 State of U.S. Financial Capability Study, nearly 8 in 10 Americans have some kind of debt, and 37 percent feel that they have too much debt.

This chapter will prepare you for managing your credit and your debt. You will learn about the benefits of good credit and the costs of bad credit and how both affect your credit reputation.

Skills and Knowledge You Will Gain Along the Way

- ✓ Appreciate how bad credit can affect you and identify ways to maintain good credit.
- ✓ Become familiar with a credit report and credit score.
- ✓ Learn why paying the minimum due on your credit card or loan can be costly.
- ✓ Recognize the warning signs of poor debt management.



Maintaining good credit is critical to your financial wellbeing. Courtesy of iStock, Credit anyaberkut

Understanding Credit

Why should you care about your credit reputation? Banks, employers, merchants, and landlords care very much when considering who they lend their money to. Often, they look at a credit report as a measure of how responsible someone is with their finances. There's nothing wrong with buying on credit, as long as you do so responsibly and remember that you're going to have to pay it back—plus interest. Credit can also be dangerous if misused. Some individuals make the mistake of viewing credit as a license to spend. Unfortunately, poor spending habits can leave you deeply in debt and damage your credit reputation for years to come.



Tip

Buying something on credit and then paying it off quickly can actually help build a good credit reputation.

Understand Your Credit Reputation

Why is a good credit reputation so important? Lenders want to make sure you have more money coming in than going out and have responsibly used credit in the past. In other words, lenders are looking at your credit reputation. A credit reputation consists of two parts: your credit report and your credit score.

Your Credit Report



Review your credit report annually and keep an eye on your credit rating. Courtesy of iStock, Credit scyther5

fraudulent activity. Fraudulent and inaccurate activity can affect your credit reputation just as badly as your own irresponsible actions can.



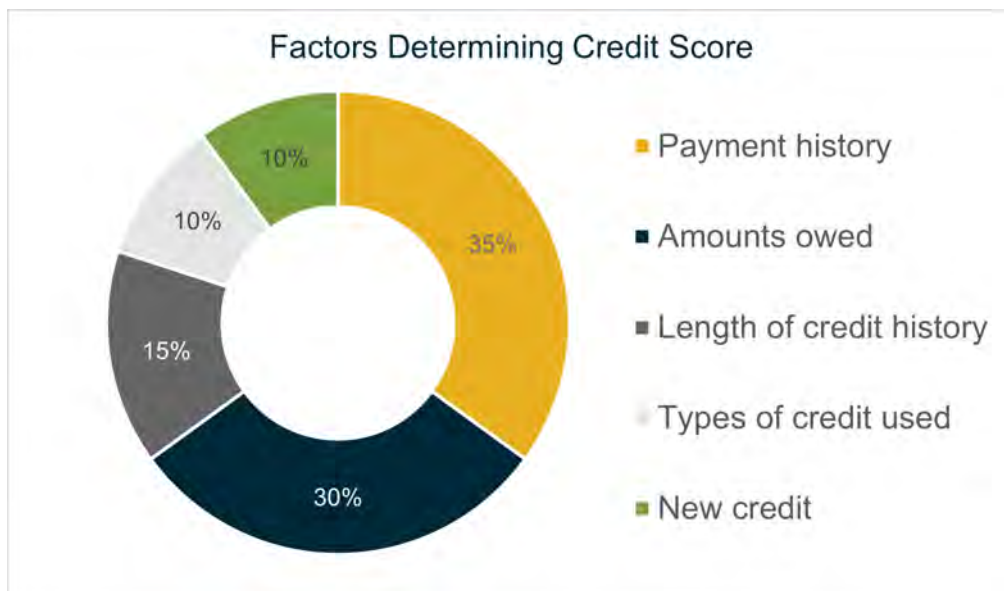
Note

You can request your free annual credit report by visiting annualcreditreport.com. This site is a centralized contact created by the three nationwide consumer reporting agencies—Equifax, Experian, and TransUnion. Ordering a copy of your own credit report does not impact your score.

Your Credit Score

As your credit history is updated, your credit score will be recalculated based on the current facts at that point in time. Your score today could be different from your score three months from now. No single factor determines your score, but payment history

is the most important factor. Even one missed payment can have a negative impact on your score. As shown in the graph below, there are several factors that go into determining your credit score, with the second most important factor being the amount owed. Using more than 30 percent of your available credit is looked upon negatively by creditors.



What can affect your credit score? Courtesy of Experian.com

The most popular credit score is the Fair Isaac Credit Organization (FICO) score. The score ranges from about 300 to 850, with the higher score reflecting a lower risk for the lender. In general, a credit score of 680 or above is considered good. If your score is high enough (above 680), you may qualify for the best rate on a loan or credit card account. A low score (below 580) may indicate credit problems or cause you to be denied credit.

Benefits of Good Credit/Cost of Bad Credit



Establishing good credit can put you on the right path for success. Courtesy of iStock, Credit Maria Vonotna

Having a good credit score and credit history is very important. But just as important is the fact that bad credit scores or no credit history often costs you in the long run.

Having good credit can benefit you in many ways, such as:

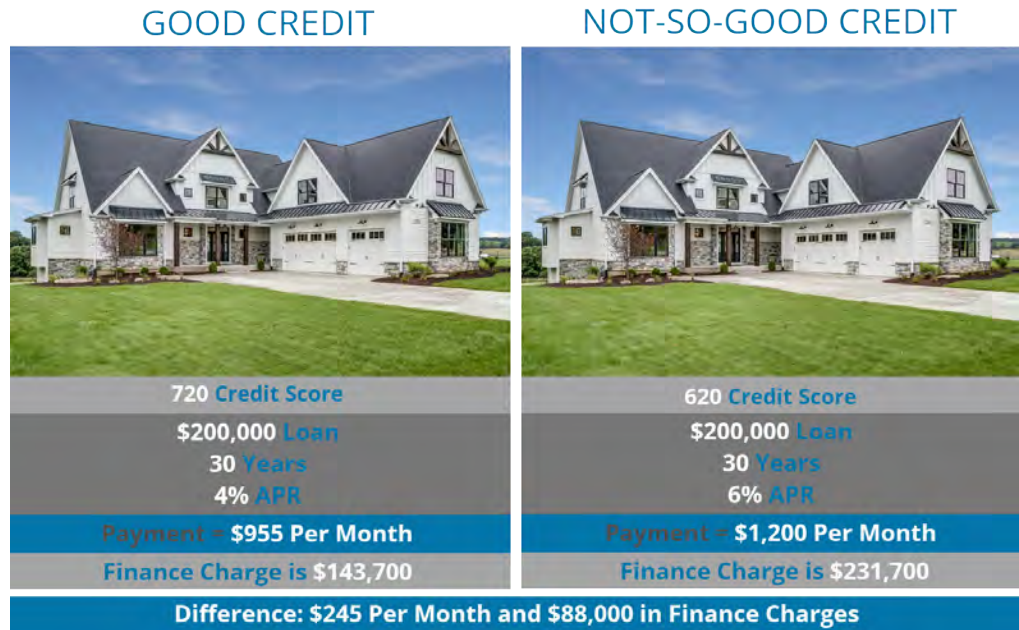
- Standing out as a responsible candidate for a job.
- Renting an apartment.
- Getting a mortgage.

- Receiving lower interest rates for any money you borrow.

On the other hand, bad credit can cause problems, such as:

- More rejections for apartments, credit cards, and loans.
- Large deposit payments for apartments or when signing up for utility accounts.
- Higher insurance premiums for cars and other property coverage.
- Much higher interest rates for any money you borrow.

These problems can all translate into thousands of extra dollars over a few years. The example below illustrates the potential cost of bad credit by looking at two hypothetical home buyers. One buyer has good credit and the other not-so-good credit. They both get a 30-year mortgage for \$200,000. The good-credit buyer gets a 4 percent interest rate, but the not-so-good credit buyer—because lenders view them as riskier—gets a 6 percent rate. Though it may not seem like much of a difference, that 2 percent more costs the credit-challenged buyer a lot of money, both in terms of the monthly payment and the total interest costs over the life of the loan.



Having to pay a higher interest rate due to a low credit score can be very costly. Courtesy of USAA

Practice Healthy Credit Habits

Just like you need diplomas and job references, you need good credit references. Using credit responsibly and building a good credit history can help you qualify for deals on loans, credit cards, insurance, and more. Follow these healthy credit habits to improve your credit reputation:

- Set up and follow a budget and have an emergency fund so you don't accidentally run up debt.
- Pay bills on time and do not skip payments.
- Pay off credit cards in full each month. Do not shift it to another credit card or to a home equity loan. If you must carry a balance, keep it as low as possible. Never max out your available limit.
- Do not default on loans. Foreclosures, bankruptcy, repossession, etc. can severely hurt your credit for years, even up to a decade.

- Do not apply for credit you do not need, despite any rewards or incentives offered for signing up. Applying for a lot of credit in a short time can cause your score to go down slightly.
- Regularly check your credit report to make sure it is error-free.
- Be careful to avoid credit repair scams. Some unethical credit repair organizations target consumers with poor credit histories with promises to clean up their credit report once they pay a fee for the service.
- Protect your sensitive information from identity theft or fraud. This information makes it easy for thieves to open accounts in your name or run up charges on your accounts:
 - Social Security number
 - Full date of birth
 - Credit card, debit card, and bank account numbers
 - Passwords and personal identification numbers (PINs)

Keeping Your Social Security Number Safe

If you Googled your name right now, I bet you would find there are many people out there that have the same name as you. What makes your identification unique is your Social Security number (SSN) and your date of birth. That's why it's so important to keep this information safe. You can help prevent identity theft or fraud by:

- Creating your *my Social Security* account today and take away the risk of someone else trying to create one in your name. ()
- Being careful with your Social Security card and number to prevent identity theft. Do not carry your card or other documents that display your SSN with you. Keep them in a safe place.
- Being careful about sharing your SSN and birth date, even when you're asked for it. You should inquire as to why this information is needed, how it'll be used, and what will happen if you refuse to provide it.

A strong financial foundation with a responsible spending plan and well-funded emergency account can empower you to make wise credit decisions. And wise credit decisions result in good credit, which opens many doors and saves you money. There is no quick fix for creditworthiness, but you can improve your credit score by engaging in good credit behaviors over time.



Note

Good credit isn't something you can buy, it's something you must earn and build.

Managing Credit Cards

Credit cards can get people into deep financial trouble. However, if you use them well, they can also have a positive impact on your financial life. It's important to not use a credit card as a license to spend now and pay later. Credit cards should typically be used for convenience and safety, not immediate gratification. Avoid the temptation to spend money you don't have or can't pay back. Discipline is key!

Choosing a Credit Card

“Free travel miles or cash back on every purchase!” These benefits sound great, but avoid basing your choice of credit card exclusively on promotions or special offers. Don’t let the fancy marketing cause you to make a bad financial decision. Instead, focus on the money; specifically, how much money the card is going to cost you. Understand the interest rate, the annual fees, and any other costs you’ll have to pay to use the card, and then consider the perks. In most cases, the more bells and whistles a card has, the more it will cost you.

Here are some guidelines to keep in mind when choosing and using a credit card:

- **Minimize rates.** Look for a card with a low annual percentage rate (APR). But beware of low introductory rates that balloon after a period of time. Always check the rates of competing credit card companies. There may be a better option for you in the long run.
- **Minimize fees.** If possible, avoid setup or maintenance fees when choosing a credit card. Search for a card with no annual fee.
- **Check the grace period.** How many days you can take to pay the credit card bill before they start charging interest and/or late fees. This is generally a minimum of 21 days. Virtually all credit cards have late-payment fees if not paid before the grace period ends, so a long grace period can be helpful.
- **Benefits.** Does the card offer things like frequent flyer miles, cash back, or hotel points? While these can be a great perk, they should not be your first consideration.

You may find that your mailbox is inundated with credit card offers, but that doesn’t mean you should apply for every card that comes your way. Having only one or two credit cards makes it easier to keep track of your spending, protects your credit reputation, and reduces the temptation to accumulate debt.

New Vocabulary

grace period—
the amount of time
before interest starts
accumulating on charged
purchases

Can't qualify for a credit card?

For a lender to approve you for a credit card, you must show a level of reliable income and a good credit history. If you are lacking in one or both areas, there are a couple options:

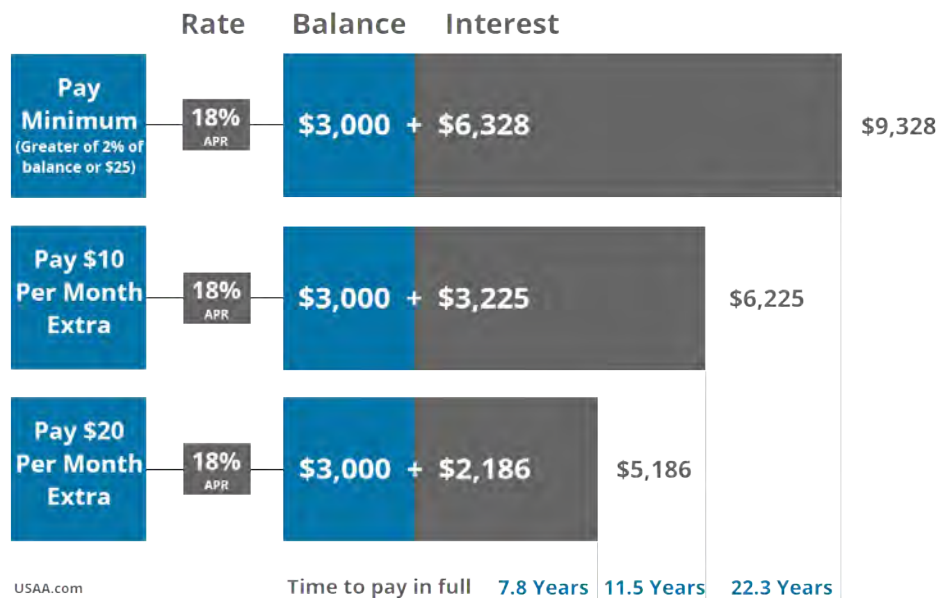
- Try obtaining a *secured credit card* from your bank or credit union. The lender will typically require you to deposit money equal to your credit limit into a separate account. Be sure to keep your balances low and make scheduled payments on time to improve your credit history.
- The bank or credit union might require someone to cosign on the credit card agreement. A *cosigner* agrees to repay the debt if you don’t and will also need to be approved by the lender.

Paying the Minimum is Costly

We learned in *Chapter 2: Investing in Your Future* the value of compound interest for our investments, but compound interest also applies to loans and credit card balances. Compound interest can be your best friend or your worst enemy.

When you only make the minimum payment, interest keeps growing on the unpaid balance. Interest compounds each time it is calculated, using the original principal plus any interest that accumulated from previous periods. This means you are paying interest on top of the interest over time. Of course, your best bet is to pay off the balance every month, but if you can’t do that, even paying just a little more than the minimum each month can make a big difference.

Here's an example that shows the difference between paying only the monthly minimum or paying a little more than the minimum. You make a \$3,000 purchase on your credit card that has an 18 percent APR. If you pay only the minimum each month, it will take about 22 years to pay off the balance and cost more than three times the original charge. (This assumes you don't charge anything more to your card.) But if you pay an additional \$10 per month, you have now paid off the balance in just over 11 years. To make it even better, pay an additional \$20 per month to reduce the payoff time to under 8 years. You are still paying quite a bit of interest, but significantly less than when only paying the minimum. Wouldn't you agree that paying \$2,186 in interest is much better than \$6,328?



The expense of only paying the monthly minimums versus the benefits of paying extra each month. Courtesy of USAA

Really consider whether it is worth paying this much extra interest to make that purchase on your credit card, especially if you can't pay off the balance immediately. If the purchase is something that you really need, just be sure to pay extra each month to pay off the balance as quickly as possible.

↑

Tip ALWAYS PAY MORE THAN THE MINIMUM REQUIRED PAYMENT EACH MONTH!

In addition to paying off the balance quickly, there are other actions you can take to limit extra costs and fees:

- **Avoid cash advances.** Most credit cards charge high interest on cash advances as soon as they post to your account.
- **Pay on time.** Virtually all credit cards have late-payment fees if not paid before the grace period ends.
- **Stay within your limit.** Your credit limit is the maximum amount you can borrow at any one time. If you exceed this amount, a fee will be applied to your account each time you go over your limit.

Understanding Debt

What is debt? Debt is the total amount that a person owes to others. This amount can include credit card debt, school loans, auto loans, mortgage, and any other kind of loan. There really is no such thing as *good* debt, but there are *better* and *worse* types of debts.

The old saying, “it takes money to make money,” can be true. Incurring debt that potentially creates value and contributes to your overall financial health is better than other types of debt. For example, earning a college degree usually means you will make more money in your lifetime. Because of this, a student loan to invest in your future earning potential could be considered a *better* debt.

Another saying goes, “if you can’t afford it, don’t buy it.” This is especially true when debt is created to purchase non-essential items. The instant gratification of an expensive meal, vacation, or clothing can take months or even years to pay back without discipline. Financing a vehicle is another debt transaction that can go wrong if you’re not careful. Debts like this could be considered *worse* debt.



Everyone gets into debt at some point but managing your debt and making a plan can help. Courtesy of iStock, Credit Oliver Le Moal

Warning Signs of Poor Debt Management

Debt can accumulate over time and sneak up on you. According to the findings from the 2108 State of U.S. Financial Capability Study, nearly 8 in 10 Americans have some kind of debt, and 37 percent feel that they have too much debt. Be aware of the warning signs of poor debt management:

- Your credit cards are “maxed out.” You are no longer spending what you have in your wallet, but instead are using your credit cards to fuel your overspending.
- You only pay the minimum due on your credit card each month. When your credit card balance is so high or your budget is so tight that you can only make your minimum payment every month, you’re overspending. You are accruing interest and paying quite a bit more in the end for your purchase.

- You splurge on fun stuff but neglect bills and fixed expenses. Financially savvy people understand the importance of paying fixed expenses before purchasing fun items.

How Much Debt is Too Much

One way to know if you have too much debt is to calculate how much you owe compared to how much you make each month, in other words, your **debt-to-income ratio (DTI)**. It is best to keep your debt-to-income ratio below 36 percent of your gross pay.

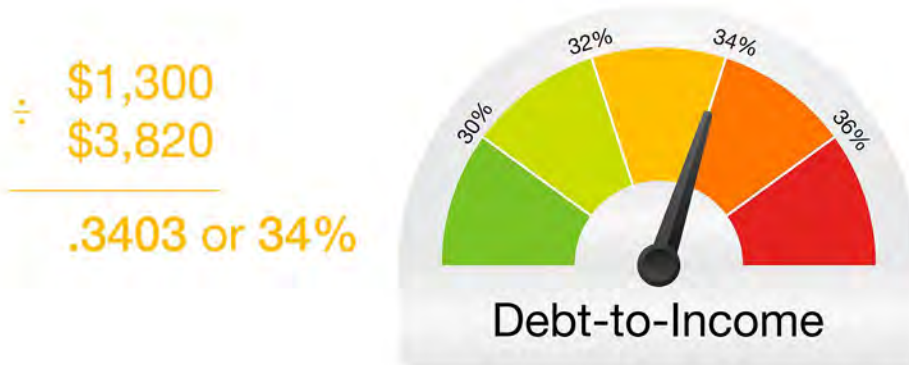
To calculate your DTI, start by adding up your total monthly debt payments—credit cards, student loans, rent, mortgage, car loan, etc. Then divide that number by your total monthly gross income (before deductions).

For example: Brian’s total monthly debt payments add up to \$1,300 per month and his total gross income is \$3,820 per month. Based on the calculation, Brian’s debt-to-income ratio is 34 percent. The amount of debt he is carrying is okay because he is under the 36 percent limit and not in the red zone. But it wouldn’t hurt for Brian to lower his DTI ratio because the lower, the better. Having a lower DTI ratio will allow Brian to better handle a financial emergency.

New Vocabulary

debt-to-income ratio (DTI)–

compares how much you owe each month to how much you earn



It's best to keep your debt-to-income ration below 36% of your gross pay. Courtesy of Orbis Technologies

Getting Out of Debt

Getting out of debt isn’t always easy. But it can be done if you have a solid game plan and the discipline to stick to it. Here are some tips to help you make that plan:

- Look to see where you’ve been spending your money and confront your debt. Look over your credit card statements, check book register, and receipts for the last two or three months. Understand what comes in, what goes out.
- Create a budget to keep you on track to purchase only what you need, allowing you to free up money to put toward your debt.
- To get out of debt, you’ve got to stop adding to it. Remove your credit cards from your wallet and only use cash. It will help you stay on budget.
- Instead of trying to pay extra on all your debt at the same time, focus on the highest-rate debt first. Pay the minimums on all your debt except for this highest-rate debt, which you’ll pay extra each month. Attack it as hard as you can to get it paid off and then attack the next one.



Tip

Don't forgo putting some money into savings. Stuff happens! And if you don't have cash in the bank to handle it when it does, you'll end up going deeper in debt to pay for it.

If you need more help to get your finances back on track, try using the services of a nonprofit credit counseling program, such as the Consumer Credit Counseling Service (CCCS) or the National Foundation for Credit Counseling (NFCC). Credit counselors can help you develop a budget or can also negotiate on your behalf with creditors to develop a debt repayment schedule. Creditors might even suspend finance fees and late-payment fees when they know you're participating in a debt management program.

If you are being hassled by a debt collector, there are several federal laws created to help protect you. Here are a few:

- The *Fair Debt Collection Practices Act (FDCPA)* is a federal law that says that a debt collector is not allowed to use false, deceptive, or misleading, or unfair practices to collect a debt. They are not allowed to harass you, threaten to have you arrested, or falsely claim that they are an attorney.
- The *Military Lending Act (MLA)* is a federal law that provides special protections for active duty servicemembers, such as capping interest rates on many loan products.
- The *Servicemembers Civil Relief Act* provides extra protections for servicemembers in the event that legal or financial transactions adversely affect their rights during military or uniformed service. These protections enable servicemembers to devote their entire energy to the defense needs of the Nation.

Beware of so-called debt settlement companies, also called debt relief or debt adjusting companies. They often claim they can negotiate with your creditors to reduce the amount you owe, but they often charge expensive fees, and in many cases, are unable to settle your debts.

As a last resort, file for bankruptcy. Personal bankruptcy is a federal process which allows you to greatly decrease or completely dismiss overwhelming debt. Bankruptcy can give you the opportunity to start over if you are hopelessly mired in debt and hopefully learn from your mistakes. There are consequences to throwing in the towel though. Bankruptcy has a negative impact on your credit rating and will remain on your credit record for as long as 10 years. Bankruptcy can mean having to pay much higher interest rates on loans, assuming you'd even qualify for a loan. Bankruptcy should always be avoided if at all possible. If you reach a point where you feel filing for personal bankruptcy is your only option, consult your legal adviser.

Critical Thinking

New Vocabulary

grace period
debt-to-income ratio
(DTI)

1. How many credit cards do you have? Do you think you have too many?

2. Are you using credit responsibly? Answer these questions to find out.
 - (A) Are you using your credit card to pay for items that should be paid for with cash?
 - (B) Is an increasing percentage of your income going to pay credit card or other debt?
 - (C) Do you pay only minimums on your charge accounts?
 - (D) Are you chronically late with your payments?
 - (E) Are you near or at the limit on your credit cards and other sources of borrowing?
 - (F) Are you unsure about how much you owe?
3. Log onto the Credit Karma® website (*creditkarma.com*) to see what your credit score is. If you don't have an account, you can create one for free. Do you think your score is high enough to get a good interest rate on loan?
4. Think about how you handle credit card purchases and payments. Do any of the poor debt management warning signs any apply to you? What might you do to change any of your bad debt habits?
5. Add up your total monthly debt payments—credit cards, student loans, rent, car loans, etc. Calculate your debt-to-income ratio. What is your DTI ratio? Is it an acceptable percentage?

Study Guide Questions

1. Does ordering a copy of your own credit report or credit score impact your score?
2. List five pieces of sensitive information that you need to keep safe from identity theft or fraud.
3. List five healthy credit habits that can improve your credit reputation.
4. Is shifting credit card debt to another credit card a good strategy for building your credit reputation?
5. What is APR?
6. What would be your debt-to-income ratio if your total monthly debt payments are \$1,050 per month and your total gross income is \$3,175 per month? Is this an acceptable DTI ratio?
7. Is taking a mortgage to purchase a house considered to be a "better" type of debt or a "worse" type of debt? Why?
8. You need to purchase two new tires for your car, but you don't currently have the money to pay for them. Which would be better option for paying for the tires: Buy them using your credit card or take a payday loan to cover the cost?

9. Is it better to pay down the debt with the smallest amount first or the debt with the highest-rate first?
10. How long can bankruptcy remain on your credit record?

Web Resources

Experian Boost: <https://www.experian.com/consumer-products/score-boost.html>

Annual credit report: annualcreditreport.com

Credit Karma: creditkarma.com

Consumer Credit Counseling Services (CCCS): consumercredit.com

National Foundation for Credit Counseling (NFCC): www.NFCC.org

Chapter 5

From Pay to Tax Payment

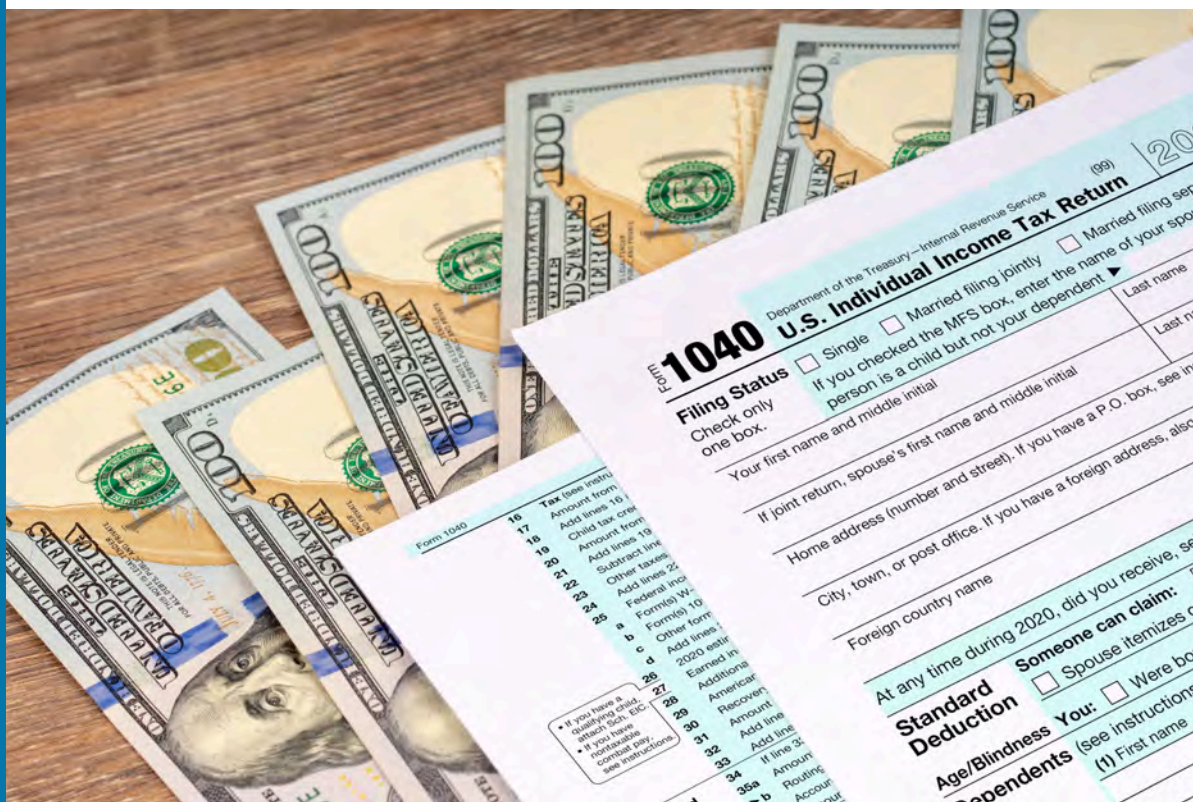
What You Will Learn to Do

If your job pays \$15 an hour and you work 20 hours, your paycheck will be \$300, right? Wrong! Earning money makes you responsible for paying taxes on that income. Taxes are mandatory contributions imposed on individuals or corporations by a government entity—whether local, state, or federal.

In this chapter you will learn about the forms and processes you will encounter from when you are hired by a new employer and receive your first paycheck all the way to filing your taxes.

Skills and Knowledge You Will Gain Along the Way

- ✓ Understand how to complete form W-4
- ✓ Recognize how to read and interpret a pay stub
- ✓ Identify key information on a Form W-2
- ✓ Become familiar with the basics of tax preparation and Form 1040 or 1040EZ



Earning money make you responsible for paying taxes on that income. Courtesy of iStock, Credit masterSergeant

Internal Revenue Service (IRS) Form W-4

New Vocabulary

withhold—
deduct money for taxes from an employee's paycheck and send it directly to the government

Each time you start a new job, your employer will ask you to complete Internal Revenue Service (IRS) Form W-4, the Employee's Withholding Certificate. The IRS requires that individuals pay income taxes gradually throughout the year, rather than all at once in April. Your employer sends money it **withholds** from your paycheck to the IRS, along with your name and Social Security number for reference. Your withholding counts toward the annual income tax bill that you calculate when you file your tax return in April. The way you fill out the Form W-4 will determine how much federal income tax your employer will withhold from your paycheck.



Note

If not enough tax is withheld from your gross pay, you may end up owing taxes and penalties when you file your annual tax return.

New Vocabulary

itemize deductions—
are expenses that can be subtracted from adjusted gross income to reduce the amount of taxes you owe

dependents—
in practical terms, it's someone who literally "depends" on the taxpayer for support

How to Fill Out a Form W-4

How you complete Form W-4 depends on your personal tax situation.

If you have one job, no spouse, no children, and you don't **itemize deductions**, then filling out a W-4 is simple. Just fill out step 1 (your name, address, Social Security number, and single as your filing status) and sign and date the form on step 5. You're done.

Conversely, if you have **dependents**, a spouse with earnings, income from other sources (for example, another job, rental income, investments, etc.) or plan to claim any tax credits or deductions, then you must complete Steps 2–4 to provide additional information. An online estimator is available if needed:

<https://www.irs.gov/individuals/tax-withholding-estimator>

Form W-4 Department of the Treasury Internal Revenue Service	Employee's Withholding Certificate	OMB No. 1545-0074 2022	
<p align="center">▶ Complete Form W-4 so that your employer can withhold the correct federal income tax from your pay. ▶ Give Form W-4 to your employer. ▶ Your withholding is subject to review by the IRS.</p>			
Step 1: Enter Personal Information	(a) First name and middle initial	Last name	(b) Social security number
	Address		▶ Does your name match the name on your social security card? If not, to ensure you get credit for your earnings, contact SSA at 800-772-1213 or go to www.ssa.gov .
	City or town, state, and ZIP code		
	(c) <input type="checkbox"/> Single or Married filing separately <input type="checkbox"/> Married filing jointly or Qualifying widow(er) <input type="checkbox"/> Head of household (Check only if you're unmarried and pay more than half the costs of keeping up a home for yourself and a qualifying individual.)		
<p>Complete Steps 2-4 ONLY if they apply to you; otherwise, skip to Step 5. See page 2 for more information on each step, who can claim exemption from withholding, when to use the estimator at www.irs.gov/W4App, and privacy.</p>			
Step 2: Multiple Jobs or Spouse Works	Complete this step if you (1) hold more than one job at a time, or (2) are married filing jointly and your spouse also works. The correct amount of withholding depends on income earned from all of these jobs. Do only one of the following: (a) Use the estimator at www.irs.gov/W4App for most accurate withholding for this step (and Steps 3-4); or (b) Use the Multiple Jobs Worksheet on page 3 and enter the result in Step 4(c) below for roughly accurate withholding; or (c) If there are only two jobs total, you may check this box. Do the same on Form W-4 for the other job. This option is accurate for jobs with similar pay; otherwise, more tax than necessary may be withheld. <input type="checkbox"/> TIP: To be accurate, submit a 2022 Form W-4 for all other jobs. If you (or your spouse) have self-employment income, including as an independent contractor, use the estimator.		
<p>Complete Steps 3-4(b) on Form W-4 for only ONE of these jobs. Leave those steps blank for the other jobs. (Your withholding will be most accurate if you complete Steps 3-4(b) on the Form W-4 for the highest paying job.)</p>			
Step 3: Claim Dependents	If your total income will be \$200,000 or less (\$400,000 or less if married filing jointly): Multiply the number of qualifying children under age 17 by \$2,000 ▶ \$ _____ Multiply the number of other dependents by \$500 ▶ \$ _____ Add the amounts above and enter the total here		3 \$ _____
Step 4 (optional): Other Adjustments	(a) Other income (not from jobs). If you want tax withheld for other income you expect this year that won't have withholding, enter the amount of other income here. This may include interest, dividends, and retirement income		4(a) \$ _____
	(b) Deductions. If you expect to claim deductions other than the standard deduction and want to reduce your withholding, use the Deductions Worksheet on page 3 and enter the result here		4(b) \$ _____
	(c) Extra withholding. Enter any additional tax you want withheld each pay period . . .		4(c) \$ _____
Step 5: Sign Here	Under penalties of perjury, I declare that this certificate, to the best of my knowledge and belief, is true, correct, and complete. ▶ Employee's signature (This form is not valid unless you sign it.) ▶ Date		
Employers Only	Employer's name and address	First date of employment	Employer identification number (EIN)
For Privacy Act and Paperwork Reduction Act Notice, see page 3. Cat. No. 102200 Form W-4 (2022)			

If you are not married and have no children, simply fill out step one and step five. Courtesy of irs.gov

Note It's a good idea to update your W-4 anytime you experience a big life change—such as the birth of a child, a marriage or divorce, or a new freelance job on the side. You can change your withholding at any time by submitting a new Form W-4 to your employer.

The Paycheck and Pay Stub

When you receive your first paycheck, you may be surprised that the amount you get to take home (*net pay*) is less than you may have figured (*gross pay*). Net pay is less than gross pay because mandatory taxes are withheld, and voluntary deductions are taken from your paycheck before you receive it. Anyone who receives a paycheck from an employer should understand the information included on their pay stub and review it regularly. Why? It's important to make sure that you are not only receiving the money you are entitled to but also paying the correct amount in taxes. With the increasing popularity of direct deposit, fewer people are receiving a physical

paycheck, which makes checking this information even more necessary. There are three major sections on your pay stub with which you should be familiar: your pay, your taxes, and your other deductions.

John R. Doe		Pay Period: 8/16/2021 to 8/22/2021		Required Deductions	Amount	YTD Amount
Earnings				Federal Income Tax	33.06	389.50
Reg Hours	Rate	Gross Earnings	YTD Gross	FICA - Social Security	29.92	324.54
38.6	12.50	482.50	5234.02	FICA - Medicare	7.00	75.90
OT Hours	OT Rate	Gross Earnings	YTD Gross	NY State Income Tax	7.92	105.42
0.0	18.75	00.00	00.00	Other Deductions		
				Health Insurance	00.00	00.00
				401K	19.30	221.94
				Net Pay	385.30	1947.39

Your Employer
1234 Some Street
Somewhere, NY 12345-6789

00888
11-7186451

PAY
TO THE
ORDER OF John R. Doe

*****Three hundred eighty-five dollars and 30 cents*****\$385.30

Some US Bank
City, NY 12543-9876

⑆222000663⑆ 123000228 00888

Sample pay stub showing the net pay after taxes and other deductions. Courtesy of Financial Wisdom Module (Navy JROTC)

- **Your pay.** What you'll see in this section depends on whether you are a salaried or an hourly worker.
- **Your Taxes.** This is often the most complicated part of a pay stub because of the variety of taxes that different people have to pay, including federal, state, and FICA (Federal Insurance Contributions Act).
- **Your other deductions.** Most paychecks will also contain several other deductions, including insurance premiums, flexible spending account (FSA) contributions, health savings account (HSA) contributions, or retirement savings plan contributions.

It's important to ensure that all the information on your pay stub is correct. If you don't understand all the information, or find an error, consult with your employer.

IRS Form W-2 and Other Information


IRS Form W-2, also known as the *Wage and Tax Statement*, is the form an employer is required to send to each employee and to the IRS at the end of the year. Form W-2 reflects the total income you earned and the total taxes withheld (as per your Form W-4) from the prior year. It also reports FICA taxes paid by the employer for the employee. Every employer who pays at least \$600 in cash, or cash equivalent, to an employee must issue that employee a Form W-2.

An employer prepares six copies of Form W-2 per employee. The employer distributes two copies and retains a copy for their records. As an employee, you get three copies. Two are used to file your taxes and one is for your records.

How to Read Form W-2

When you prepare your income taxes, you will need to input the data found on your W-2 into a Form 1040 individual tax return. (We will take a closer look at Form 1040 in the next section.) Tax documents are filed for the previous year. For example, if you receive a W-2 form in January 2022 it reflects your income earned and taxes withheld for 2021.

Every Form W-2 has the same fields, no matter the employer. The form is divided into state and federal sections since employees must file taxes on both levels. Some fields provide the employer's information while the remaining fields are mostly details of the employee's income and tax withholding from the previous year.

a Employee's social security number		Safe, accurate, FAST! Use 		Visit the IRS website at www.irs.gov/efile		
b Employer identification number (EIN)		1 Wages, tips, other compensation	2 Federal income tax withheld			
c Employer's name, address, and ZIP code		3 Social security wages	4 Social security tax withheld			
		5 Medicare wages and tips	6 Medicare tax withheld			
		7 Social security tips	8 Allocated tips			
d Control number		9	10 Dependent care benefits			
e Employee's first name and initial Last name Suff.		11 Nonqualified plans		12a See instructions for box 12		
		13 Statutory employee <input type="checkbox"/> Retirement plan <input type="checkbox"/> Third-party sick pay <input type="checkbox"/>	12b			
		14 Other		12c		
				12d		
f Employee's address and ZIP code		15 State Employer's state ID number	16 State wages, tips, etc.	17 State income tax	18 Local wages, tips, etc.	
				19 Local income tax	20 Locality name	

Form **W-2 Wage and Tax Statement** **2022** Department of the Treasury—Internal Revenue Service
 Copy B—To Be Filed With Employee's FEDERAL Tax Return.
 This information is being furnished to the Internal Revenue Service.

Sample of Form W-2. Courtesy of irs.gov

Some important fields to make note of:

- Boxes a, e, and f contain your social security number, name, and address. Verify this information if correct. If it is incorrect, ask your employer to correct and forward the corrected W-2 to the IRS and SSA.
- Boxes 1 and 2 show your taxable income—including wages, salary, tips, and bonuses—and how much federal income tax your employer withheld from your pay.
- Boxes 3 and 5 and 4 and 6 spell out how much of your earnings were subject to Social Security tax and Medicare tax and how much was withheld. Every taxpayer in the U.S. must contribute to Social Security and Medicare programs.
- Box 12 details other types of compensation or reductions with a single or double letter code that corresponds to each. For example, contributions to a **401(k)** plan will show code D with the amount of the contribution.
- Boxes 15 through 20 all relate to state and local taxes, including how much of your pay was subject to these taxes and how much was withheld.

New Vocabulary

401(k)—
 a retirement investment account offered through employers

IRS Form 1040

Form 1040, the tax form used by individual taxpayers, was first introduced in 1913. The form's basic setup has remained mostly the same over the past century. In the past, the IRS mailed Form 1040 and its accompanying instruction booklet to taxpayers. However, since more and more people file their taxes electronically, the IRS stopped automatically sending these forms. Also, Form 1040 isn't always enough to complete your return. Many people have to attach additional forms and schedules to their return to claim tax credits or tax deductions. That's why it's easier to use online tax filing software (such as H&R Block or Turbo Tax that walks you through questions and completes all the necessary forms for you) or a tax professional.

Regardless of how you do your taxes, it is beneficial to understand some of the tax terminology and what options are available to you.

Itemized Deduction vs. Standard Deduction

Tax deductions reduce your taxable income. The lower your taxable income, the lower your tax bill. The actual tax savings depend on your tax bracket. For example, for a person in the 24 percent income tax bracket, a \$1,000 tax deduction would lower the amount of tax they owed by approximately \$240, or 24 percent of \$1,000.

Most taxpayers have the option to either itemize deductions or claim the standard deduction that applies to their filing status. Both types of deductions are amounts that can be subtracted from your adjusted gross income (AGI) to lower the amount of taxes you owe. The difference is that the *standard deduction* is a fixed dollar amount that varies by filing status year to year. For example, for tax year 2021, the standard deduction for a single filer was \$12,550. An *itemized deduction* is an expense that can be subtracted from your AGI—such as mortgage interest, charitable gifts, and investment interest. Unlike the standard deduction, the dollar amount of itemized deductions varies by the taxpayer, depending on the expenses they deduct.

If the value of expenses that you can itemize is greater than the standard deduction, it likely makes sense to itemize. However, the type of expenses that can be itemized was drastically reduced in 2018. Nearly 9 in 10 taxpayers now take the standard deduction. Even if you take the standard deduction, there are still several additional tax deductions available.

Tax Deductions versus Tax Credits



Talk to an experienced tax preparer if you need help maximizing your tax breaks. Courtesy of iStock, Credit AntonioGuillem

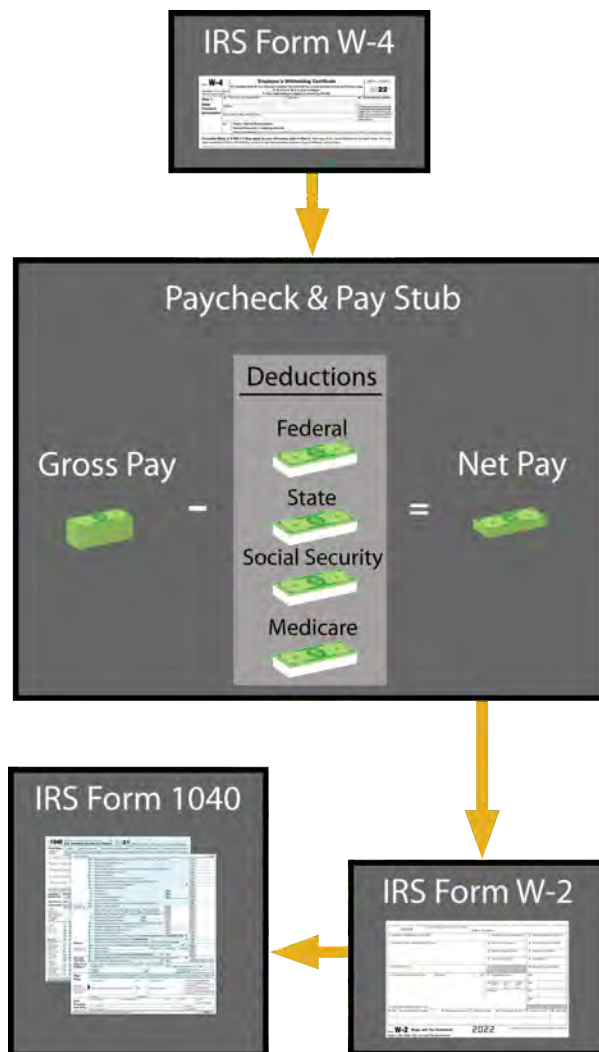
As mentioned in the previous section, tax deductions reduce your taxable income. *Tax credits*, however, are a dollar-for-dollar reduction in the amount of tax you owe. For example, if you calculate your tax bill to be \$4,500 and you are eligible for a \$1,000 tax credit, your tax bill is cut by \$1,000 to \$3,500. Tax credits are a great way to reduce your tax burden. There are several available tax credits:

- **American Opportunity Tax Credit (AOTC).** Up to \$2,500 tax credit that can only be used for the first four years of undergraduate education.

- **Lifetime Learning Credit.** Up to \$2,000 tax credit per tax return for tuition, fees, required books, and supplies with no limit on the number of years you can take this credit.
- **Saver’s Credit.** The Retirement Savings Contributions Credit (otherwise known as the “Saver’s Credit”) is a tax credit designed to encourage low-income and moderate-income families to prioritize retirement contributions. It makes it possible for single filers to receive up to \$2,000 as a tax credit, while joint filers can receive up to \$4,000.

Conclusion

Let’s review the flow from pay to tax payment. The W-4 form tells the employer the amount of tax to withhold from your paycheck based on your marital status, number of allowances and dependents, and other factors. This withholding is reflected on your pay stub. Your employer sends you Form W-2 that details your total income and taxes paid so that you can file your tax return using Form 1040.



From pay to tax payment. Courtesy of Financial Wisdom (Navy JROTC)

Critical Thinking

New Vocabulary

401(k)
cumulative
dependents
itemize deductions
Medicare
Social Security
withhold

1. Which would you prefer? Withholding more of your income from each paycheck so that you get a fairly substantial refund after filing your taxes or withholding the appropriate amount so that you have that extra amount in your paychecks every month?
2. Are you comfortable with doing your own taxes or would you prefer to pay a fee for the help of a tax professional?
3. What is the current standard deduction for a single filer? Based on your tax situation, would it be better to itemize your deductions or take the standard deduction?

Study Guide Questions

For the purposes of questions 1 and 2 below, your personal identification information is as follows:

John R. Doe, 45 Main Street, Any Town, NY 12367-0045

SSN: 987-65-4321

1. You have a job working at a retail store that you started earlier this year. You are paid on a weekly basis and your paycheck is directly deposited into your checking account. You get a copy of your pay stub by email. Using your pay stub (below), answer the following questions:

John R. Doe				Pay Period: 8/16/2021 to 8/22/2021		Required Deductions	Amount	YTD Amount
Earnings						Federal Income Tax	33.06	389.50
Reg Hours	Rate	Gross Earnings	YTD Gross			FICA - Social Security	29.92	324.54
38.6	12.50	482.50	5234.02			FICA - Medicare	7.00	75.90
OT Hours	OT Rate	Gross Earnings	YTD Gross			NY State Income Tax	7.92	105.42
0.0	18.75	00.00	00.00			Other Deductions		
						Health Insurance	00.00	00.00
						401K	19.30	221.94
						Net Pay	385.30	1947.39

- (A) Did you work a full 40-hour week this pay period?
- (B) How much money was deposited into your checking account for this pay period?
- (C) How much money has been deposited so far this year?
- (D) What is the total amount you paid in taxes this pay period?
- (E) What are your total contributions to your 401(k) so far this year?

2. It is now the following year and it's time to pay your taxes. The retail store mails you a copy of your W-2. Using your W-2 (below), answer the following questions:

a Employee's social security number XXX-XX-4321		Safe, accurate, FAST! Use		Visit the IRS website at www.irs.gov/efile			
b Employer identification number (EIN) 55-5666222		1 Wages, tips, other compensation 9650.00	2 Federal income tax withheld 661.20				
c Employer's name, address, and ZIP code Your Employer 1234 Some Street Somewhere, NY 12345-6789		3 Social security wages 9264.00	4 Social security tax withheld 598.40				
		5 Medicare wages and tips 9264.00	6 Medicare tax withheld 140.00				
		7 Social security tips	8 Allocated tips				
d Control number		9	10 Dependent care benefits				
e Employee's first name and initial Last name Suff. John R. Doe 45 Main Street Any Town, NY 12367-0045		11 Nonqualified plans		12a See instructions for box 12 D 386.00			
		13 Statutory employee Retirement plan Third-party act pay <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>	12b				
		14 Other		12c			
				12d			
f Employee's address and ZIP code							
15 State Employee's state ID number NY NY4597-5639	16 State wages, tips, etc. 9650.00	17 State income tax 391.75	18 Local wages, tips, etc.	19 Local income tax	20 Locality name		

Form **W-2** Wage and Tax Statement **2022** Department of the Treasury—Internal Revenue Service
 Copy B—To Be Filed With Employee's FEDERAL Tax Return.
 This information is being furnished to the Internal Revenue Service.

- (A) Were any contributions made to your 401(k)?
- (B) The numbers in Box 1 and Box 3 reflect your wages, but why is the number in Box 3 different from Box 1?
- (C) Were more taxes withheld for federal or for NY?
- (D) If you lived in the state of Florida, what would be in Box 17?
- (E) Were any local taxes withheld?
3. Which department collects federal income taxes in the United States?
4. The *Federal Insurance Contributions Act (FICA)* mandates that every taxpayer in the U.S. must contribute to which two government programs?
5. How much money do you need to earn before an employer must send you a W-2?
6. Is a tax deduction or a tax credit defined as a dollar-for-dollar reduction in the amount of tax you owe?
7. Do most taxpayers take the standard deduction or itemize their deductions when they file their taxes?

Web Resources

Form W-4 online estimator: <https://www.irs.gov/individuals/tax-withholding-estimator>

Credentialed tax preparers: <https://www.taxpreparerregistry.com>

Understanding Insurance

There are several different types of insurance, but they all provide the same basic thing: protection. The most common types of personal insurance include auto, property (homeowners and renters), life, health, and disability. Most individuals in the U.S. have at least one of these types of insurance, and auto insurance is required by law in most states.

Even an emergency fund cannot prepare you for catastrophic loss or illness. Insurance is often the better answer as it minimizes risk and offers monetary protection in the event of accidents, medical emergencies, and natural disasters.

What is Insurance?

Insurance is defined as a legal contract, called a *policy*, between you and an insurance company to provide financial protection against losses described in the policy—up to a certain amount of money. The insurer agrees to compensate you for a covered loss to your vehicle, property, life, health, or whatever a policy might cover. The policy details exactly what is covered and what is excluded, as well as any conditions for coverage.

The core components that make up most insurance policies are the premium, policy limit, and deductible:

- **Premium.** The premium is the price for the coverage and is determined by the insurer based on your risk profile, which may include creditworthiness. For example, if you have been in several accidents, your auto insurance premiums will likely be higher than someone with a perfect driving record.
- **Policy Limit.** The policy limit is the maximum amount an insurer will pay under a policy for a covered loss. Typically, higher policy limits carry higher premiums.
- **Deductible.** The deductible is a specific amount the policyholder must pay **out-of-pocket** before the insurer pays a dime. For example, if you have a \$500 deductible on your auto insurance policy, then you will have to pay \$500 toward repairs from an accident while the insurer pays the remainder, up to the policy limit. Policies with very high deductibles are typically less expensive, but you need to factor in the high out-of-pocket expense per claim.

New Vocabulary

out-of-pocket—
pay with one's own money rather than with money from another source



Tip

If you have an emergency fund and can afford to pay a higher deductible, you can save money on your monthly budget by paying lower premiums.

Why You Need Insurance

While no one ever expects bad things to happen to them, they have a way of occurring anyway, often at the least convenient time. As movie character Forrest Gump said, “Life is like a box of chocolates—you never know what you’re going to get.”

The main reason to spend money on insurance now is to avoid spending even more money later. Not having insurance is a gamble with the potential occurrence of unforeseen incidents. Insurance products help you in not only mitigating risks but also help you by providing a financial cushion during your time of need.

What could happen if you take that gamble and don't have any insurance or the right type of insurance? Here are a couple of scenarios:

- You are having a great time snowboarding with friends when you suddenly fall and break your leg. Without insurance, you would have to incur the cost of a trip to the emergency room for X-rays and a cast, which could cost several hundred dollars.
- You are on your way to work when someone suddenly pulls out in front of you and collides with your car. The front end of your car ends up with quite a bit of damage. Without insurance, you would have to pay the full cost of the repair. And if you are hurt in the accident, that's a substantial medical bill. Keep in mind that most states require you have some kind of auto insurance.
- You are now a little older (and hopefully wiser) and are happily married with two kids. How will your spouse be able to pay the mortgage, send the kids to college, and pay normal day-to-day expenses in the case of your unforeseen death?
- One windy night, you are watching TV with your family when a tree falls and lands on your shed. The cost of rebuilding or repairing the shed could be quite expensive without insurance. Not to mention the cost of replacing or repairing your lawnmower that was damaged in the shed.



Insurance makes it easier to handle the unexpected. Courtesy of iStock, Credit AwakenedEye

Filing A Claim

Insurance companies use specific lingo that would be helpful to know if you ever need to use your insurance coverage to recover losses. Let's use an example used earlier to walk through the insurance process learning the lingo along the way.

John is driving to work one morning when someone suddenly pulls out in front of him and collides with the front end of his car. Luckily no one is hurt. While waiting for the police to come and make an official report, John exchanges insurance information with the other driver. When John gets back home, he submits a *claim*, which is a formal request to have the insurance company make payment for the damage. The insurance company asks John to get an *estimate* of the cost to repair his car. John's auto mechanic prepares a detailed list of what it will cost to fix, and the estimate of \$1,050 is submitted to the insurance company. An insurance *claims adjuster* investigates John's claim. After reviewing all the evidence, including reviewing the estimate and inspecting the damaged car, the adjuster decides that the claim is valid,

and the insurance company must pay the claim. John receives a check for \$850 for the *insurance settlement*, which according to the policy terms, has a \$200 deductible. This means that John is responsible for paying the first \$200 to repair the damage while the insurance settlement is responsible for paying the remainder.



Note

Be sure to read your insurance policy to find out exactly what you need to do to file a claim for that policy. And be honest about what happened. Lying can land you in jail for insurance fraud!

Life Insurance

Life insurance is a contract with an insurance company that agrees to pay your chosen **beneficiary** a sum of money upon your death, in exchange for monthly or annual payments (*premiums*). Your beneficiary might use this sum of money, called a *death benefit*, to pay final expenses, pay the rest of your mortgage, or cover any expenses for your loved ones.

The amount you pay for a life insurance policy can vary widely among life insurance companies and policy types. Premiums are based on your insurability and risk class—generally determined by the following factors: age, gender, lifestyle, health, and occupation.

You may not need life insurance if you have saved to pay final expenses and no one is financially dependent on you. On the other hand, if you have a family, would they be financially prepared to cover the household expenses and mortgage if you were no longer around to help? Life insurance helps to cover these costs so your family will not face a financial hardship during an already challenging time.

New Vocabulary

beneficiary—
the person (or persons) who will receive the payout after you pass away



Having some life insurance is better than having none at all. Courtesy of iStock, Credit Fokusiert

Term Life and Permanent Life Insurance

There are two main categories of life insurance available: term life insurance and permanent life insurance.

Term life insurance offers protection for a fixed period of time, usually ranging from 10–30 years, where premiums are locked in during the selected term. If you die while the policy is in force, your beneficiary receives a death benefit. A term life plan is usually affordable, but if you miss a payment, your policy will terminate. Also, there is no cash value with a term life policy like there is with a permanent life insurance policy.

Permanent life insurance provides lifetime coverage and not only has a death benefit but has a cash value. *Cash value* is the portion of your policy that earns interest (as an

investment feature). This type of insurance has more benefits than term life, but also comes with a higher premium. Keep in mind that you don't get both the death benefit and the cash value. You can also close out the policy at any time and receive the cash value. But should you unexpectedly die, your beneficiary will only receive the death benefit and the insurance company keeps any accumulated cash value.

The following are some of the types of permanent life insurance policies available, each with slightly different features and benefits:

- Whole life insurance
- Universal life insurance
- Variable universal life insurance
- Indexed universal life insurance

Annuities

An annuity can generate income for retirement. It is a contract with an insurance company in which you make a lump-sum payment or series of payments and, in return, receive regular disbursements at some point in the future. The life insurance company invests your payment and pays back the returns generated from it. Most annuities also feature a standard death benefit.

There are some disadvantages to annuities, including their complexity. The growth potential may be limited and inflation can erode your annuity's value. Expenses can add up, and you could pay more in taxes. All things to consider when thinking about an annuity.



Tip

Talk to a life insurance agent to help you determine which type of life insurance is best for you and your situation.

Servicemember Eligible Insurance

Members of the military are also eligible for Servicemembers' Group Life Insurance (SGLI). Premiums for a SGLI policy are based on coverage amount—up to \$400,000—not insured's age. Also included is *Traumatic Injury Protection Insurance*, which provides financial assistance to service members during recovery from a serious traumatic injury. *Veterans' Group Life Insurance* (VGLI) can be obtained within 240 days of separation from active duty without proof of good health.



Everyone needs to be prepared to protect their family's future. Courtesy of iStock, Credit Peppersmint

Property Insurance

It's important to protect your home and belongings from theft or disaster. Property insurance can provide protection and coverage for property owners and renters.

Homeowners Insurance

Homeowners insurance is one type of property insurance. It helps protect your home in the event of any unforeseen calamity, fire, damage, or theft. Your home insurance policy will pay for the cost of repairs or rebuilding a dwelling, whichever is needed. A policy can even provide coverage for valuables and personal property inside the house that was damaged or stolen.



Note

Generally, auto insurance does not cover personal possessions that may be stolen from your vehicle. For that you need a homeowners or renters' policy.

Depending on the policy and where you live, homeowners may need to purchase separate policies, or *riders*, for protection from fires, floods, or other natural disasters. You can even purchase a rider for identity recovery coverage that reimburses you for expenses related to being a victim of identity theft.

The cost of homeowners insurance depends on where you live and the replacement cost of your home and valuables. This can vary from a few hundred dollars to several thousand dollars annually.

Renters Insurance

You don't even have to own your home to need property insurance; many landlords require their tenants to have renter's insurance. But whether it's required or not, it's smart to have this kind of protection. If you rent your home, apartment, condominium, or live in military-provided housing and do not have renters' insurance, you have no coverage if your possessions are stolen or damaged. Do not assume your landlord's insurance will protect your possessions. Landlords generally carry insurance only on the building itself. Renters' insurance can also cover you if you were held legally liable for injury to someone or for damage to their property. Renters' insurance is relatively inexpensive, costing an average of \$18 a month.



Tip

Whether you own a home or rent, good luck getting the insurance company to replace items if you don't have proof that you owned them. Keep receipts for big-ticket items and have photos or videos of your belongings. Store copies of your personal property inventory in a safe place, away from your home.

Basic Levels of Coverage

There are essentially three basic levels of coverage: actual cash value, replacement cost, and extended replacement cost/value.

- **Actual cash value.** Covers the cost of the house plus the value of your belongings after deducting *depreciation*, which is how much the items are currently worth, not how much you paid for them.
- **Replacement cost.** Replacement value policies cover the actual cash value of your home and possessions without the deduction for depreciation, so you would be able to repair or rebuild your home up to the original value.
- **Extended replacement cost/value.** The most comprehensive coverage, this inflation-buffer policy pays for whatever it costs to repair or rebuild your home—even if it's more than your policy limit. This means the insurer offers more coverage than you purchased, but there is a ceiling.

Does it Matter?

Insurers will cover property for either the actual cash value or the replacement cost. Does it matter which? Yes! It's the difference between getting reimbursed what your three-year-old laptop is worth today versus getting reimbursed enough money to buy a new laptop. It matters!

New Vocabulary

liability, liable—*the state of being legally responsible for something*

Personal Liability for Damage or Injuries

Liability coverage protects you from lawsuits filed by others. This clause even includes your pets! So, if your dog bites your neighbor—no matter if the bite occurs at your place or theirs—your insurer will pay their medical expenses. Or, if your neighbor slips on the ice on your front porch and successfully sues for pain and suffering or lost wages, you'll be covered for that, too. For extra protection, consider an Umbrella policy, where a few hundred dollars more in premiums can buy you an extra \$1 million or more in protection.

What is an Umbrella Policy?

An umbrella insurance policy provides an additional layer of security against lawsuits for damages to other people's property or injuries caused to others in an accident. It also protects against libel, vandalism, slander, and invasion of privacy. Consider an umbrella policy if you own dangerous things that can cause injury, such as a swimming pool, trampoline, or dogs. The umbrella policy kicks in after the basic liability coverage of the homeowners, renters, or auto policy is exhausted.



An umbrella insurance policy is extra liability insurance coverage that goes beyond your homeowners or auto policy. Courtesy of iStock, Credit mohd izzuan

Auto Insurance

Auto insurance covers the cost of vehicle repairs in the event of a car accident. With the exception of New Hampshire and Virginia, all states in the U.S. require drivers to have auto insurance. Virtually all states have established minimum liability coverage limits for passenger vehicles, and many also require uninsured motorist coverage. If you are financing a vehicle, most lenders also require “full coverage insurance” that includes comprehensive and collision coverages to repair or replace the vehicle if it is damaged or stolen.

Premiums

Auto insurance premiums vary by state and are based on how likely you are to have a loss and how much those losses will cost. These are the factors that may affect your premium:

- **Gender.** Premiums tend to be higher for males than females. Statistically male drivers tend to be involved in more accidents than female drivers.



Avoiding traffic tickets can help lower your premiums. Courtesy of iStock, Credit Nomadsoul1

- **Age and marital status.** Generally, premiums decline as young drivers age. However, after 65 years of age, premiums may begin rising again. Also, married drivers usually pay lower premiums than single drivers.
- **Where you live.** Drivers living in metropolitan areas generally pay more than drivers in rural areas. Also, drivers with a long commute to work or tend to put a significant number of miles on their car generally pay more.

- **Type of vehicle you drive.** Expensive and high-performance vehicles tend to be more costly to insure. The vehicle's likelihood of theft, repair costs, and safety record may also affect premiums.
- **Driving record.** The better your driving record (avoiding accidents and tickets), the lower your premiums.
- **Financial responsibility.** Having a lapse in auto insurance coverage, or a history of late or missed payments, may increase your premiums. You will need to provide your Social Security number (SSN) so the insurer can check your credit history.

How to Lower Premium Costs

Check with your insurance company to see what discounts you may qualify for and additional ways to lower your premiums. Here are a few things you can do:

- **Check for discounts.** Most auto insurers have discounts for various things, like a good-driver discount or a good-student discount. So, drive safely and maintain high grades in school to help lower your premium costs.
- **Raise your deductible.** You can ask for higher deductibles, but make sure you have enough in an emergency fund to cover the deductible, if needed.
- **Reduce or eliminate collision and comprehensive coverages on older vehicles.** But only if reducing or eliminating this coverage will not put you in a tough financial spot if you later need it.
- **Take a defensive driving course.** Take a state-approved defensive driving or drug and alcohol awareness class to reduce your premiums.
- **Improve your credit rating.** See Chapter 4 for ways to improve your credit score.

Bodily Injury Liability/Comprehensive/Collision

Auto insurance is purchased as a package of several coverage types. Each is priced separately and protects you in specific circumstances. Available coverage and minimum requirements vary by state. There are several specific coverage types that you may find as part of your package, but the most important ones are:

- **Comprehensive.** Pays up to the actual cash value, unless otherwise stated, for damage to your vehicle *from some cause other than collision with another vehicle*. Such as damage caused by fire, vandalism, flood, hail, or hitting an animal. Comprehensive also pays for loss if your vehicle is stolen. This coverage is subject to a deductible and is required by most auto loan lenders.

- **Collision.** Pays up to actual cash value, unless otherwise stated, *for damage to your vehicle* when your vehicle hits or is hit by another vehicle or object (excluding animals). Collision is subject to a deductible and is required by most auto loan lenders.
- **Bodily Injury Liability (BI).** Protects against lawsuits made against you *if you are responsible for an accident*. BI *does not compensate for your own injuries*, but will pay for accident-related medical expenses, lost wages, and pain and suffering for *injury to another person*.
- **Medical Expense or Personal Injury Protection.** This generally pays for accident-related medical expenses for you and your passengers, *regardless of whether you cause an accident*. In states having **no-fault laws**, this coverage may be called *personal injury protection (PIP)*.

New Vocabulary

no-fault law—
requires every driver to
file a claim with their own
insurance company,
regardless of who was at
fault



Accidents can happen! Be sure you are properly covered. Courtesy of iStock, Credit Robert Crum

What Auto Insurance Does not Cover

- Purses, cellphones, laptops, or any other item stolen from inside the vehicle. (Homeowners or renters insurance covers this.)
- Routine maintenance, such as oil changes or new tires.
- Mechanical breakdowns or defects in the car.

Health Insurance

Health insurance helps you pay your medical bills. Coverage is important because costs of treatment for even routine checkups and illnesses can run several hundred dollars and can make a mess of anyone's spending plan.

You might be thinking, "I'm young. I'm healthy. Why do I need health insurance?" As of 2014, due to the Affordable Care Act, all Americans (with few exceptions) are required to purchase health insurance or pay a penalty. Even if it wasn't required,

medical insurance is one of the best purchases anyone can make, as medical expenses are the most common, unanticipated expense and can be the costliest.

When choosing the right health insurance plan for your specific needs and budget, it's important to consider all the options available to you. However, we understand that this is easier said than done, and that there are many confusing factors to keep in mind.

Deductible

A deductible is the amount you pay out of pocket each year for most eligible medical services or medications before your health plan begins to share in the cost of covered services. For example, if you have a \$2,000 yearly deductible, you'll need to pay the first \$2,000 of your eligible medical costs before your plan helps you pay. Once you reach your \$2,000 deductible, your plan will cover a certain percentage of all eligible services for the remainder of the year. Typically, the insurer covers 80 percent of the cost, and you pay 20 percent.

If you're generally healthy and don't expect to need costly medical services during the year, a high-deductible plan may be a good choice for you. Even though your deductible will be higher, you will have a lower monthly premium payment and your medical costs should be minimum. On the other hand, let's say you know you have a medical condition that will need care, or you have an active family with children who play sports. A plan with a lower deductible and higher premium that pays for a greater percentage of your medical costs may be better for you.

HMO vs. PPO

These abbreviations may be familiar to you since they're thrown around a lot when talking about insurance, but what do they mean? Health Maintenance Organizations (HMOs) and Preferred Provider Organizations (PPOs) are two of the most popular types of medical health insurance plans. Here are a few notable differences between HMOs and PPOs:

- **Primary Care Doctors and referrals.** With an HMO, you'll have a primary care doctor who you (and your family) will go to for most health care needs. If you want to see a specialist, you must get a referral from your primary care doctor. You will not receive coverage to see an **out-of-network** doctor. With a PPO, you don't need to name a primary care doctor or get a referral to go to a specialist. You can get out-of-network care, but you may have to pay more for it.
- **Premium costs.** HMOs tend to have lower premiums than PPOs, though this can differ from plan to plan. With a PPO, the trade-off for receiving coverage outside of your network is usually a higher monthly premium.
- **Plan costs.** With HMOs, deductibles are rare and **copays** are usually minimal, though this can differ from plan to plan. PPOs may have deductibles and may have higher copays.

When deciding between an HMO or a PPO, it's important to consider your budget but also your health care needs and preferences.

New Vocabulary

out-of-network—
a doctor or facility that has no contract with your health plan

copay—
a flat fee that you pay each time you go to your doctor or fill a prescription



A hospital stay can be very expensive. Health insurance helps you pay your medical bills. Courtesy of iStock, Credit Wavebreakmedia

HSA vs. HRA vs. FSA

Here are some other acronyms you may have seen in relation to health insurance. All these accounts help you pay for qualified medical expenses, but the process and specifics are different for each:

Health Savings Account (HSA). An HSA is an account owned by an individual. It is a tax-advantaged account that is for people with high-deductible health insurance plans. Both the person on the account and their employer can contribute a certain amount of money to your HSA account each year. Any contributions to your account are tax deductible. Money from the account can be used to cover medical expenses that your insurance plan may not cover, including your premiums or deductible. Any unused funds in the account simply roll over into the following year. Because you own the account, even if you leave your job, the account stays with you.

Health Reimbursement Arrangement (HRA). An HRA is an employer-funded plan that reimburses employees for qualified medical expenses and sometimes health insurance premiums. Unlike an HSA, HRAs are not bank accounts, they are an agreement between the employee and employer. The employee must make the healthcare payment, and then have it reimbursed after. This also means that an employee can't take their HRA with them if they leave their job.

Flexible Spending Account (FSA). An FSA is similar to an HSA, but the account is connected to the employer rather than the employee. Contributions made by the employee are still tax deductible and can be used to cover medical expenses that the employee's insurance plan may not cover, including premiums or deductible. But, if those contributions are not used by the end of the year, they do not roll over and are lost. Also, if you leave your job, the account does not come with you.

Military Medical Insurance Plans

As a benefit of service, health insurance plans are provided to military personnel. Some of these plans include:

Tricare. The military provides Tricare health coverage for active-duty, nonactive-duty, and retired service members, their spouses, and children. There are three Tricare plans available Tricare Prime, Tricare Select, and Tricare for Life. Each of the Tricare plans have different requirements, fee structures, and treatment facility options.

VA Medical Benefits. The Department of Veterans Affairs (VA) provides a medical benefits package to all eligible veterans. This plan provides a full range of preventative and inpatient services within the VA health care system. Once enrolled, you can be seen at any VA facility across the country.

Additional Medical Plans

Dental: Most medical insurance does not cover routine dental care. In order to get insurance for things like cleanings or root-canals, you'll need to enroll in a separate dental insurance plan.

Vision: Most medical insurance does not cover routine vision care. In order to get insurance for things like eye exams, glasses, and contacts, you'll need to enroll in a separate vision plan.

Disability Insurance

In general, disability insurance covers some of your income if something happens to you (like an illness or injury) and you can't work. That's why many people think of disability insurance as "paycheck protection." It pays you a percentage of your total income when an injury or health issue (even pregnancy) prevents you from working.

But disability insurance doesn't just cover freak accidents. Most claims are for things you may not realize are considered disabilities, such as physical injuries, heart attack, or cancer. These can happen to anyone at any time in any workplace, and you could be left unable to work for months or even years.

There are two types of disability insurance, short-term disability and long-term disability. They both pay a percentage of your income, but the difference is how long the payments last. Short-term disability usually lasts three to six months, but this can vary by policy. Long-term disability can last five years or longer, if your disability continues.

Fortunately, disability insurance is a common perk offered by employers. It isn't there to make you rich, it's there to pay the bills and put food on the table if something happens to you.

Benefits of Service

Health and disability insurance are provided to active-duty military personnel as part of the benefits of service. Life insurance is also available to service members and their families; however, some situations may dictate purchasing additional personal coverage.

Conclusion

The number of insurance policies a person should have, and the level of protection those policies provide, depends on the individual. Regardless of income or the value of the property someone owns, some types of insurance are recommended for everyone: namely, health insurance and car insurance.

It is important to review your current situation and your current insurance coverage at least annually to determine if anything has changed and if you have adequate protection. For any of your insurance needs, consider talking to an insurance professional.

Critical Thinking

1. Imagine that your home was destroyed today and your insurance agent asked for a list of all your belongings kept in your room. From memory, create a list of the items in your room. Take the list home and add to it anything you missed. Did you remember everything? Or would it have been better to have a list and photos stored in a safe place?
2. If you own a home on the ocean coast in Florida, what riders to your homeowner insurance should you consider? Why?
3. You have homeowner's insurance that has a \$200 deductible. Read the scenarios below and answer the questions.
 - (A) In a big windstorm, you lose several shingles on your roof and have to place your first claim. It is going to cost \$475 to fix. How much do you have to pay? How much will the insurance company pay? Why?
 - (B) Your son and a friend are playing catch in the yard when a baseball goes through the window. You place another claim because it's going to cost \$1,250 to fix. How much do you have to pay? How much will the insurance company pay? Why?
4. Consider your current health, financial, and family situation. Would it be better for you to have health insurance that has a high-deductible, but a low premium or that has a low-deductible, but a higher premium? Why?

New Vocabulary

beneficiary
copay
liability, liable
no-fault law
out-of-network
out-of-pocket

Study Guide Questions

1. Your cell phone has been stolen from your car. Which type of insurance will cover your stolen phone and help you purchase a new one?

2. What is the amount the policy holder must pay first before the policy pays the rest?
 - (A) Policy limit
 - (B) Deductible
 - (C) Premium
 - (D) Claim
3. What is the role of an insurance claims adjuster?
4. Name three factors that determine your life insurance insurability and risk class.
5. Which category of life insurance offers a cash value?
6. If your apartment should get damaged by fire, your landlord would be responsible for paying to replace your personal property. True or False?
7. Even though it may cost more, which is the better level of coverage for a homeowner's insurance policy, actual cash value or replacement cost?
8. What is the name of the policy that provides extra liability insurance coverage that goes beyond the limits of your homeowners or auto insurance?
9. List four factors that may affect your auto insurance premiums.
10. Which of the following health accounts can you take with you after you leave your job; HRA, FSA, or HSA?

Financial Planning

What You Will Learn to Do

“A goal without a plan is just a wish.” – Antoine de Saint- Exupère

Whether it is a dream vacation, a new car, or retiring early, everyone has a wish. But wishes aren't enough. You need the power of planning to turn your wishes into goals you can actually achieve. In this chapter, you will learn about the financial planning process. From having a solid understanding of your current personal financial situation to clearly defining your financial goals. Once you've defined those goals, you can create and execute a plan of action. Don't forget to make adjustments along the way. Things change. Financial planning isn't a one-time event, it's an ongoing process.

Skills and Knowledge You Will Gain Along the Way

- ✓ Learn how to calculate your net worth.
- ✓ Understand the importance of having clearly defined goals.
- ✓ Understand the various options for saving for retirement, including military options.
- ✓ Recognize with what to look for in a professional financial planner.



Financial planning is an ongoing process. Courtesy of iStock, Credit anyaberkut

Financial Planning

Financial planning is a personal journey and can mean different things to different people, and as such, there is no one-size-fits-all approach. A financial plan is designed to help you make the best use of your money and achieve your long-term financial goals, whether they are buying a home, sending your children to college, or enjoying a comfortable retirement. Financial uncertainty can cause worry and stress. Knowing where you would like to be and what resources you have to make that possible can help alleviate the stress.

When managing your finances and making your financial plan, make sure that you are living a balanced lifestyle. If you don't save at all, you will never have financial independence. If you save every penny you make, you will probably not enjoy the fruits of your labor. There must be a balance. It's okay to have fun, just make sure you are living within your means and not overspending at the expense of your long-term financial goals.

Calculate Your Net Worth

Your net worth can provide a snapshot of your current financial position. It is the value of all your assets minus the liabilities you owe. Getting organized and doing a comprehensive overview of your finances to calculate your net worth can help you start your financial planning process.

There are three steps to calculating your net worth:

1. **Add up the value of all your assets.** Think about what you own—your home, cars, jewelry, investments, 401(k), etc. Don't forget to include your bank accounts, certificates of deposit (CDs), and the cash value of life insurance policies. Be sure to use **fair-market value** and put a price on each item as if you sold it today.
2. **Add up all your liabilities.** Consider who you owe—personal loans, mortgages, car loans, credit card balances, student loans, etc.
3. **Subtract your total liabilities from your total assets to calculate your net worth.**

If you have a positive net worth, keep up the good work! The goal is to grow your net worth over time. If you have a negative net worth, don't be discouraged. You can turn things around with discipline and time.

Regardless of whether you have a positive or negative net worth, you should have a budget so that you know where your money is going day to day. Understanding your cash flow will help determine how much might be available for saving and investing to grow your net worth. (See *Creating a Monthly Budget* in Chapter 1.)

Identify Your Financial Goals

It's always good to have a clear idea of why you're saving your hard-earned money. An important step to financial planning is to identify the financial goals you would like to achieve. Some goals may be short-term, and others may be 30 years from now. Whether you have goals of a fully funded emergency fund, purchasing a vacation home, or early retirement, the idea is to brainstorm and put it in writing. Make sure you set goals that are attainable, not merely dreams—like retiring by age 30. Be very specific in terms of what you would like to accomplish and when. This will help you visualize achieving your goals and keep you focused.

New Vocabulary

fair-market value—
*estimated amount a
buyer and seller would
likely agree upon under
current normal conditions*

Retirement Planning

No matter what your priorities are, your financial plan should include a strategy for accumulating the retirement income that you need. Even if it's a long way off, think about what you want your money to do for you when you retire, and create a plan to make it happen.

Why Start Now?

If you are trying to determine whether to begin saving for retirement now, consider these facts:

- The sooner you begin, the more money you may be able to accumulate. (Think back to how compound interest helps with that.)
- You can't foresee how long you will be able to work. Injury, illness, or other difficulties could interrupt your future earning and saving ability.
- You can't count on Social Security alone to cover all your expenses in retirement.
- You don't know how long retirement will be. With longer life expectancy, you could need enough retirement savings to last 30 years or more.

How Much Should I Contribute?

When saving for retirement, a good starting point is to contribute 10 percent of your gross income. This means if you have a \$50,000 salary, you should aim to contribute \$5,000 per year (\$416 per month) into your retirement fund. As your income grows, so should that percentage. If possible, aim to contribute 15 percent. The easiest way is to set up automatic contributions to your retirement account and increase your savings after every pay raise or promotion.

Types of Retirement Accounts

There are many types of retirement plans available in today's market. Since every situation is unique, it's important to look for the retirement account that best lines up with your personal job situation and future goals. Here's a look at how several of the available retirement plans work and how to make the most of these long-term savings vehicles.

401(k)

A 401(k) is a retirement account that is offered through employers. The IRS limits how much you can contribute each year. For example, in 2021, the IRS allowed you to contribute up to \$19,500. The amount you contribute to a 401(k) is deducted directly from your taxable income, thus reducing your federal income taxes. Your money grows tax-free until you withdraw it, at which time it is subject to taxes.

Some companies contribute to a 401(k) plan on behalf of employees and match a portion of what the employee contributes. Taking advantage of employer contributions is one of the fastest ways to grow your retirement account. For example, if you contribute 10 percent of your \$50,000 salary to your retirement fund, your employer will match 4 percent of that contribution. That's an extra \$2,000 of free money toward retirement!

The downside to a 401(k) is that you may not take money out of the account before age 59 ½ or be forced to pay penalties. You must, however, start taking withdrawals from the account, known as *required minimum distributions*, starting at age 72.

Additional types of employer retirement accounts are 403(b) and 457(b) plans. They are similar in many ways to a 401(k). If you work for a nonprofit or tax-exempt organization, you may be eligible for a 403(b). A 457(b) plan is offered through state and local governments.

New Vocabulary

earned income—wages, commissions, bonuses earned from working

Individual Retirement Account (IRA)

An IRA is only available to those with **earned income**. If you earn \$2,000, you'll be able to put up to \$2,000 into the IRA account for retirement. However, there is a contribution limit that varies each year—for example, in 2021, the limit was \$6,000.

Like a 401(k), you'll receive a tax deduction for the money you put into an IRA. When you withdraw funds, they will be considered taxable income. You'll need to start taking distributions from the account after you turn age 72.

Roth IRA

Like an IRA, you need earned income to be eligible for a Roth IRA, and the amount contributed cannot be more than that amount you earn. In addition to the general contribution limit that applies to both Roth and traditional IRAs, your Roth IRA contribution may be limited based on your filing status and income.



Note

The total contributions you make each year to all your traditional IRAs and Roth IRAs can't be more than the specified amount for that year. For example, in 2021, you cannot contribute more than \$6,000 total for all IRAs and Roth IRAs combined.

Unlike a traditional IRA, you will have to pay taxes on the amount you contribute to a Roth IRA. The contributions are not deductible for federal income tax purposes. However, the upside is that the money grows tax-free in the account, and no income tax will be due on Roth IRA withdrawals in retirement. A Roth IRA is the only account where you can get tax-free money at retirement and does not require that you take distributions.



Tip

If you are young, consider a Roth IRA. Pay the tax upfront for the contribution and allow it to grow 30 or more years tax-free. Then when you retire, you don't pay a penny in income tax on distributions!

Thrift Savings Plan (TSP)

Service members have another tax advantaged option—the government-sponsored TSP, which generally works like a 401(k) plan offered by some civilian employers. The TSP allows members to invest their own money in either stocks or government securities, along with a contribution to that account from their employer. After the first 60 days in the service, all members are enrolled in TSP and receive an automatic government contribution of one percent of basic pay into their account each month. You become fully vested (the money becomes yours and you can take it with you when you leave the military) beginning at your 25th month of service. Matching contributions also begin at that point. Additionally, service members are automatically enrolled to contribute three percent of their out-of-pocket basic pay to the TSP each

month. After two years of service, the government will match the member's contributions up to an additional four percent, in addition to the one percent automatic contribution.

There are a variety of TSP mutual fund options available, and you may allocate your monthly contribution to any or all the funds. Also available to service members is a Roth TSP. Similar to a Roth IRA, contributions are made with after-tax money and when money is withdrawn for the Roth TSP in retirement it is typically tax-free. There are no income restrictions on contributions to the Roth TSP as well.

Blended Retirement System

The military retirement system is arguably the best retirement deal around. Unlike most retirement plans, the military offers a pension that starts the day you retire, no matter how old you are. That means you could start collecting a regular retirement pension as early as 37 years old!

The military made major changes to its retirement system on Jan. 1, 2018, adding the *Blended Retirement System (BRS)*. The “blending” in BRS comes from the blending of two major sources of retirement income: the existing pension provision for those who retire after 20 or more years of service, plus the Thrift Savings Plan (TSP). The BRS pension is calculated by multiplying the length of service times two percent times the average basic pay for the highest 36 months of pay.

For example, after serving for 20 years with an average basic pay for the highest 36 months of \$4,700, your monthly pension would be \$1,880:

$$\boxed{20 \text{ YEARS OF SERVICE}} \times \boxed{2\%} \times \boxed{\$4,700} = \boxed{\$1,880 \text{ per month}}$$

Conclusion

The circumstances in your life are constantly changing and you may need to modify your financial goals accordingly. Don't forget to revisit your goals at least annually and adjust as appropriate. There are many options available for investing and saving for retirement and it can be overwhelming. The key is to start early, take advantage of employer benefits, and don't be afraid to ask for advice from a professional financial planner.

Critical Thinking

1. What is your net worth? Do you have more in savings and investments, or do you owe more in loans and credit card debt?
2. Are you saving any money for retirement today?
 - (A) If yes, are the contributions going to a 401(k), IRA, Roth IRA, or other type of account? What percentage of your gross income are you contributing?
 - (B) If no (or if yes, but not 10 percent), what can you do to achieve the 10 percent recommended contribution?
3. Go to *irs.gov* and find out what the IRA contribution limits are for this year?

Study Guide Questions

1. Is starting to fund your emergency fund with \$1000 a short-term goal or a long-term goal?
2. At what age can you start withdrawing from a 401(k) without penalty?
3. You currently are not employed, but you receive a birthday gift of \$200 from your grandparents. Can you put that \$200 into an IRA?
4. If the contribution limit is \$6000 and you have already contributed \$4000 to an IRA, how much can you contribute to a Roth IRA?
5. Who is eligible to contribute to a Thrift Savings Plan (TSP)?
6. Which retirement account type gives you a tax break on the contributions?
7. Which retirement account type has no income tax due on withdrawals in retirement?

Web Resources

Budgeting and Money Management for Young Adults:

<https://mint.intuit.com/blog/personal-finance/money-management-for-young-adults/>

Unit 3

Leadership and Ethics

Leadership is a key ingredient to the success of any military unit. In fact, leadership is a key ingredient to the success of *any* organization, whether it be a Fortune 500 company, a small privately owned business, a non-profit organization, a school or a volunteer activity. How a unit's leadership performs will directly impact how that organization or unit meets its mission and goals.

You have probably heard the phrase that certain individuals are “born leaders.” The phrase is often used to describe individuals who are characterized as being good or strong leaders. The truth is, however, that becoming a good leader takes work, and the various skills that make a leader effective must be developed. This unit will help you develop those skills that will make you an effective leader—a respected person who can guide, direct, motivate, and help others achieve a common goal. You will also learn that to be a respected and effective leader, you must demonstrate strong values such as honesty, integrity, and ethics.

Chapter 1

The Fundamental Principles of Leadership

What You Will Learn to Do

In this chapter you will learn about the basics of leadership and how to motivate and inspire those you are responsible for. You will learn there is a difference between being a boss and being a leader. You will also learn about the leadership principles that some senior military leaders have developed over their careers. Their principles are part of the reason these leaders are admired.

Skills and Knowledge You Will Gain Along the Way

- ✓ Understand the importance of developing communication skills to explain your organization's goals and vision to your subordinates.
- ✓ Learn how to motivate a diverse set of personalities.
- ✓ Appreciate the importance of listening to your subordinates.
- ✓ Understand the importance of showing trust in those you lead.
- ✓ Learn the importance of engaging with your subordinates.



The crew of USS Theodore Roosevelt (CVN-71) gather for an all hands call by the commanding officer. Courtesy of DVIDS, Photo by SA Kayliannas Genier

What Leadership Is and What It Isn't

One might think defining leadership would be a very difficult and complex question. The array of books and articles on the subject are literally countless. If you were to search the internet using Google, for example, and search “leadership definition,” you would see a list of over 2.5 billion entries.

The books and articles you can pick from to read about leadership can be both informative and interesting. Some are also very complex and offer a variety of charts, graphs, diagrams, and a range of illustrations that attempt to illustrate what leadership is all about.

However, the focus of leadership really centers around one word—people. Leadership is having the ability to inspire a team to reach certain goals. Reaching those goals requires individuals who are placed in positions to influence, inspire, motivate, and help others become their best. Leaders help people under their charge improve both professionally and personally.

One of the time-worn phrases that we often hear is “*They are a born leader.*” The truth of the matter is that we are all born, but to become a leader takes work. Just like it takes work to be an artist who tries many different strokes and colors to capture what is in their mind.

According to Max DePree, the founder of the Herman Miller Furniture Company, leadership is not something that is necessarily learned simply from reading books. DePree believes leadership requires recognizing and connecting the variety and diversity of gifts that people on a team or organization bring to the table (DePree 2004, p. 9). Leaders are those who recognize and cultivate these gifts to enhance their team’s performance. Stated another way, it is recognizing the diversity of personalities and skills of a team and polishing those personalities and skills to reach goals.

The importance of leadership is captured by motivational speaker, author, and philanthropist Tony Robbins. Robbins says leadership lies in the ability to get things done by communicating a clear vision and then uniting your team around that vision. In business, Robbins believes leadership improves a company’s bottom line, has less turnover, and has a mindset of continuous improvement (Robbins).

An analogy can be made when going aboard a ship and visiting a **department** and **division**. When you speak to a crewmember, they are enthusiastic and motivated. The pride the individual has in their ship is obvious. As you speak to other crewmembers, you learn their participation in **advancement exams** is very high. Their promotion and retention rates are also high because their leaders ensure they have time to study. They talk about how they have meetings with their department or division officers who keep them apprised of their training and **deployment schedule**. Their leadership also keeps them informed about major policy decisions made by senior Navy leadership in Washington. Sailors will say this type of communication makes them feel valued. Like those in the restaurant who may be focused on the bottom line, the department or division on a ship has a bottom line too. That bottom line is a ready and trained crew with high morale. It is quite clear the leadership is doing its job when you see a shipboard division or department with high morale.

What may work for one leader in motivating and inspiring their people may not work for another. It takes work to find the techniques—like those strokes that an artist seeks—that work. Most importantly those techniques must be practiced daily.

A good leader will know how to adjust their leadership techniques to each situation and to the various team members. A leader may have to take one team member aside and have a lengthy conversation. Another team member, on the other hand, may accept an explanation in front of a larger group and not be offended for being singled out.

New Vocabulary

department—*one of many key organizations onboard a ship reporting directly to the commanding officer and administratively to the executive officer*

division—*group reporting to a department head*

advancement exam—*one of the key factors in determining an enlisted Sailor's ability to be promoted*

deployment schedule—*advanced notice of time away from normal duty station*

What Key Techniques or Skills a Leader Must Possess

There are three key techniques, or skills, that a leader must possess in some form to be effective. They are communication, honesty, and integrity.

Communication

New Vocabulary

end state –
the final outcome at the successful completion of a military operation

Communication is obviously one, if not *the* most important, skill a good leader must possess. Any organization or team wants to know where they are going. What are its goals? Why are we doing something a certain way? What is the **end state**? What are we attempting to achieve? Keeping your people informed and providing answers to these questions is critical.

Good communication also means listening to feedback from your team. If you tell your team why you are doing something a specific way, they may say, “Hey. Thanks for letting us know why we’re doing that. But I think I have a better, safer way to do it. Here’s what I think.” But you do not receive this type of feedback unless you communicate to your team first and do so on a continuous basis. Communicating to your crew or your team on a regular basis says, “I trust and respect you.” We’ll provide some examples of this later in this chapter.



Feedback is essential in any organization and understanding the desired end state will help everyone move together in the same direction. Courtesy of iStock, Credit Dilok Klaisataporn

In a worldwide survey, researchers found that 34 percent of employees thought their companies did not listen to their ideas about how to improve things (Boogard). This reflects a lack of communication. Trust is built upon a foundation of communication. As a leader, sharing information tells your team you want them to understand you, but you also welcome the opportunity to understand them.

Communication also allows a leader to explain to their team how and why a decision is made. Nothing is more frustrating to a team member than to see a decision being made that makes no sense. It can lead to poor morale. Communicating the reason for

that decision can be extremely helpful. Some members of the team may not agree with the decision but providing some insight will go a long way in reflecting trust.

Honesty

Being honest with your team is another important element of being a leader.

Let's say your ship is on deployment and is scheduled to return home in 30 days. However, the news about a geographic-political situation in the ship's area of responsibility (AOR) is a bit apprehensive. The captain gets the word that the ship is being extended because of the situation. Families back home are sending emails to the crew and are beginning to speculate about the ship's homecoming. Crewmembers are concerned and rumors begin to circulate.

The captain must tell the crew immediately about the extension. Sitting on bad news does not help any situation. Effective leaders understand the importance of honesty. Being honest—and sometimes being the bearer of bad news—can be very difficult. However, being honest helps foster a level of trust with those you are responsible for. Stated more simply, it's called "shooting straight."

We have used the word *trust* several times in this discussion. It's obviously an important quality that goes both ways. Every leader must have trust in their people—and their people have trust in their leaders. For team members, trust means they know their leaders have their backs and will support them.

Integrity

Another critical element of being a leader is having integrity. Integrity basically translates to a leader's doing or behaving in the exact same way they ask their team members to do or behave. It's very **demoralizing** for a leader who says one thing and then does the exact opposite. For example, a division officer tells his Sailors about the dangers of alcohol and then they learn about the officer's driving under the influence charge. This can be destructive to the morale of a division. The officer has lost his division's respect, trust, and credibility. Gaining those qualities back is virtually an impossible task.

As you grow and mature as a leader, you will discover and develop other elements that you feel are important in your leadership toolkit. You may also feel that some of your personal qualities may need to be better shaped or developed. For example:

- Does your patience need to grow?
- Do you need to be more tolerant of mistakes?
- Do you need to be more hands on with your team?
- Do you need to delegate tasks to your **subordinates** more than you do?
- Should you become more engaging with your people?

Leaders must commit themselves to adjust their style—just like the artist who is always **cognizant** of his brush strokes. Ask yourself:

- Is there a better way?
- Is there a more effective way to communicate with my division or team?
- Am I communicating enough?
- What do they expect from me?

We will address some of these questions as we progress through this chapter.

Finally, you will know when you have begun to become a leader when you see some of your techniques being duplicated by those who work for you. In essence, they are

New Vocabulary

demoralizing—
causing someone to lose confidence or hope

New Vocabulary

subordinates—
one who is lower in rank or position
cognizant—
have knowledge or being aware of

developing their own leadership techniques and using you as a mentor. Becoming a mentor to others is a high honor and speaks volumes about what you have achieved.



Helping people grow is an essential part of being a good leader. Courtesy of iStock, Credit IvelinRadkov

The Difference Between Being a Boss and Being a Leader

During your professional career, you will work with and for some outstanding leaders—individuals you will want to model yourself after. You will learn many things from them. You will also observe several people who will make you shake your head and say, “If ever given the chance to lead, I will not be like that guy.” Nevertheless, you can learn from the weak leaders as well—for example, what not to model yourself after and how not to treat people.

One of the most exceptional pieces that defines leadership is found in the book *African Laughter* by Doris Lessing (Lessing 1992, p. 231). Lessing was a white British novelist, poet, playwright, and short-story writer. She won a Nobel Prize for literature in 2007. After that short description of her, a common reaction might be, “What does Doris Lessing know about leadership?”

Lessing was born in Iran and moved to Southern Rhodesia when she was six years old. She lived there for about 25 years before moving to London. During her time in Southern Rhodesia (now Zimbabwe), Lessing developed some fond memories and returned to Zimbabwe four times. In *African Laughter*, she recounts those four visits after being exiled from Southern Rhodesia for her opposition to the white minority program.

In her last visit in 1992, Lessing presented a pessimistic view of the Robert Mugabe regime that had taken over the country’s government. During that visit, she noticed tensions that existed between the whites and the blacks. The whites that remained in Zimbabwe after its independence were critical of the blacks and longed for the days when whites ruled. She noticed intense hostility. For example, on one occasion, when Lessing encountered a pregnant black woman on the street, her white friends warned her not to give the woman a ride. She gave her a ride and at the same time heard her

brother refer to blacks as “inferior.” Upon visiting a Zimbabwe government office, Lessing noticed a poster on the wall that contrasted a black *leader* and a white *boss*. The poster read:

The Boss drives his men.
The Leader inspires them.
The Boss depends on authority.
The Leader depends on goodwill.
The Boss invokes fear.
The Leader radiates love.
The Boss says, “I.”
The Leader says, “We.”
The Boss shows who is wrong.
The Leader shows what is wrong.
The Boss knows how it is done.
The Leader knows how to do it.
The Boss demands respect.
The Leader commands respect.
So be a leader
Not a boss

The health, happiness, and productivity of many organizations in today’s world can be measured by the words on the poster Lessing saw at the government office in Zimbabwe. So-called leaders that lead by fear and intimidation do not have any knowledge about the people who work for them—their marriage status, where they live, their home state or how many children they may have.



Don't be a boss. Courtesy of iStock, Credit Ivan-balyan



Be a leader. Courtesy of DVIDS, Photo by CPO Latrice Jackson

Here is another story of Jason who worked for an individual who practiced coaching as part of his professional development. In one of his personal sessions, he asked Jason what he could do to be a better leader. Jason told him that he needed to get away from his computer and mingle with his team—say hello and ask team members about their current projects. Jason told him, “Be visible and show our team that you’re interested in them and what they’re doing. Tell them you appreciate what they do every day to make our organization successful.”

chain of command—*hierarchy of reporting relationships from the bottom to the top of an organization; who must answer to whom*

Some people associate such a leadership tool with what is termed as *management by walking around*.

“I can’t do that,” he told Jason. “I feel I would be interjecting myself in the **chain of command**.”

This response reaffirmed this individual’s reputation as a poor leader and why he commanded little respect. He was looked upon as being arrogant and uncaring. Even in the elevators of the building, he chose to basically ignore colleagues with rarely even a brief “hello.”

To achieve the level of leadership documented on the poster Lessing saw in the Zimbabwe office takes a significant amount of practice and patience. You first learn by observing others and see how they motivate and teach. Do you want to be like the coach that refused to walk around the organization or refused to acknowledge people in the elevator? Or do you want to be like another individual who knows your name, your hometown, your marriage status, how many children you have or perhaps even your birthday?

How you develop and practice your leadership skills will help those in your charge feel better about the organization and motivate them to work harder and improve their skills.

What differentiates leaders from non-leaders is not so much the exterior person but the interior one (Kouzes and Posner 2016, p.19). In other words, you do not have to be the great public speaker with a deep voice and your hands flapping when you speak to those in your charge. Being a leader means you are committed to guiding, engaging, and helping those in your charge to become better individuals both professionally and personally.

A leader who supervised personal shoppers for a global grocery chain had a reputation for being a good leader. She had managed and supervised several stores for a major retail chain and was hired for her leadership skills, specifically to heal a group of unhappy and disconnected team members. Here is what she received from a team member at Christmas:

Happy Holidays!! Thank you so much for everything you do, not only for me but for our team. Thank you for always advocating for me and giving me the support that I always need. Over the last year I’ve seen such a positive shift in the team, and I can only say that you are the biggest contributing factor. You allow us to be heard and seen. You push us to do our best each and every day. You’re an amazing manager and we are so thankful for you.

In this case, the word *leader* would have been better than *manager* in the last sentence. Regardless, in this case the manager stepped up to play her role as leader. The words from the team member are powerful and compelling. More importantly, they show the impact good leadership can have on a team.



Marines succeed together because they are trained to work as a team. Key to this is leadership in the non-commissioned officer (NCO) ranks. Courtesy of DVIDS, Photo by Cpl. Jacob Pruitt

Admiral Charles Larson's Guiding Principles of Character and Leadership

One of the Navy's leaders that commanded a high level of respect was Admiral Charles Larson. He was both an aviator and a submariner, however most of his illustrious career was spent in submarines.

He announced his retirement from the Navy in 1994. At the time he was serving as the Commander of the **U.S. Pacific Command** which oversaw all U.S. military services in that region of the world—350,000 Army, Navy Air Force and Marines. Any number of Fortune 500 companies would have welcomed him as a member of its executive team or board of directors.

At the time of his retirement, the **U.S. Naval Academy** was suffering from a very serious cheating scandal involving more than 125 midshipmen. Unfortunately, the scandal occurred a few years after another incident that also received a significant amount of media attention. The incident involved the chaining of a woman to a urinal in a male bathroom at the Naval Academy.

The cheating scandal received both national and international media attention, primarily because of the school's excellent reputation of producing proud and polished naval officers. Senior Navy officials in Washington felt the Academy needed new leadership to make a much-needed course correction and restore its image. The answer was Adm. Larson—a well-respected leader with impeccable credentials.



U.S. Naval Academy Courtesy of DVIDS, Photo by Staff Sgt. Mozer Da Cunha

New Vocabulary

U.S. Pacific Command—this command's area of responsibility goes from the west coast of the U.S. to the western border of India and from the North Pole to Antarctica
U.S. Naval Academy—preparatory school and/or one of 63 NROTC units at colleges and universities across the United States

superintendent—
*equivalent to a college or
 university president*
NROTC or OCS –
*Navy Reserve Officer
 Training Corps or Officer
 Candidate School*

Rather than let Larson retire, Navy leadership asked Larson to return to the Academy to restore its image. He had served as the Academy’s **superintendent** (equivalent to a college or university president) when he was a two-star rear admiral.

Larson accepted the offer because he believed in the school, and he wanted to ensure it remained rooted in integrity, character, and honor. Larson knew that he had some fixing to do.

Larson felt the Academy needed to ensure its graduates, future Navy and Marine Corps officers, understood they were the same officers as officers from other commissioning sources (for example, **NROTC or OCS**)—just better prepared as leaders.

Larson interestingly referred to the Academy as a leadership laboratory—a place where future officers could develop their leadership techniques. The midshipmen had to learn how to follow before they learned how to lead. Larson always told the midshipmen that they had four years to develop their initial set of leadership tools and techniques, learning from those they saw as effective leaders as well as those believed to be ineffective.

In short, Larson felt the Academy needed to develop future officers who were committed to excellence—but committed to excellence without arrogance. To do so, Larson put together ten guiding principles on posters and provided them to each midshipman and staff member. Although developed for the Naval Academy, the principles are relevant for anyone who aspires to be a leader. They outline how we all should live our lives. Those principles are:

- Uphold the standards of the Naval Academy [or insert the name of any organization or unit].
- Be a person of integrity.
- Lead by example (meet the standard you are holding others to).
- Strive for excellence without arrogance.
- Do your best.
- Treat everyone with dignity and respect.
- Tolerate honest mistakes from people who are doing their best.
- Speak well of others (rumors and unveiled anecdotes undermine morale).
- Seek the truth (rumors and unverified anecdotes undermine morale).
- Keep a sense of humor and be able to laugh at yourself.

Individuals who served with Larson at the time ensured they had copies of the poster when they left his staff. Many placed the posters in their new offices because the principles were relevant to any organization—principles that all leaders and anyone who aspired to be a leader should practice daily.

Larson’s leadership style favored humility. The Wall Street Journal, citing several studies, contends “humility is a core quality of leaders who inspire close teamwork, rapid learning, and high performance in their teams.” (Shellenberger 2018).

The head of human resources for a global hotel chain says that humility is an emotional skill leaders need to have. Humility allows a leader to listen, provides a respect for diverse views, and a willingness to hear suggestions and feedback. Teams with humble leaders performed better and did higher quality work than teams whose leaders exhibited less humility (Shellenberger 2018).

General Colin Powell's Leadership Principles

It is not uncommon for those who serve or have served in leadership positions to keep a list of the principles they felt were key components of leadership. Another individual who documented his principles was General Colin Powell.

Powell was an extraordinary leader who retired as a four-star Army general. Unlike many other officers who achieved four-star status, Powell did not attend West Point. Instead, he was a member of the ROTC unit at the City College of New York. After serving on active duty, including **Chairman of the Joint Chiefs of Staff**, Powell served as **Secretary of State**. Powell was beloved by all whom he worked for and by all who worked for him. When he died in 2021, most of the major television networks provided live coverage of his funeral services.

Like Adm. Larson, Gen. Powell documented his leadership parables in his book *It Worked for Me: In Life and Leadership*. He refers to them as his “13 rules” (Powell 2012, p. 3-28).

Powell says as he developed these rules, he placed them under the glass on his desk:

1. It ain't as bad as you think. It will look better in the morning.
2. Get mad, then get over it.
3. Avoid having your ego so close to your position that when your position fails, your ego goes with it.
4. It can be done.
5. Be careful what you choose: You may get it.
6. Don't let adverse facts stand in the way of a good decision.
7. You can't make someone else's choices.
8. Check small things.
9. Share credit.
10. Remain calm. Be kind.
11. Have a vision. Be demanding.
12. Don't take counsel of your fears or naysayers.
13. Perpetual optimism is a force multiplier.



General Colin Powell served as Secretary of State from 2001 to 2005. Courtesy of the Department of State

New Vocabulary

Chairman of the Joint Chiefs of Staff—the principal military advisor to the President, Secretary of Defense and the National Security Council (NSC)
Secretary of State—a senior cabinet secretary who carries out the president's foreign policies

Why Leadership is Important to All Organizations

New Vocabulary

bottom line—
*the readiness of the unit,
trust in their leaders, and
level of morale*

An organization, such as a corporation, private company, non-profit, government agency, or a military unit, requires leadership. For anyone who has served in leadership positions in a variety of organizations, the practiced leadership principles are the same. It takes people to make any organization function. Leaders who can communicate a clear vision to the team get things done and thrive. Every organization has goals. For some it may mean improving its **bottom line**. In a military organization, the bottom line is not financial. The bottom line for a military unit is a well-trained group that has an extremely high level of morale that results from good leadership. Members of a unit that is well-trained and have trust in their leaders can respond confidently to life-or-death situations or ones requiring instant decision-making.



Leaders can inspire the team by showing how working together can bring success. Courtesy of iStock, Credit Cecille_Arcurs

Let's compare any type of organization to a piece of cloth. The quality of the cloth depends on the threads used to make it. The cloth can be strong; it can be weak and tear easily; or it can be a beautiful piece of carefully woven tapestry. It all depends on the quality of the threads used to make the cloth. The threads in this case are the leadership principles we have seen discussed in this chapter.

How are the appointed leaders using leadership principles?

- Do they know the members on their team?
- Do they engage with them?
- Do they communicate with them regularly and provide feedback?
- Have they communicated the goals of the organization?
- Do they encourage or seek the team's opinions or ideas on how to do things more safely or efficiently? If so, do they inform them why one of their ideas may not work?
- Have they provided their team sufficient training?
- Do they show respect for their teams?
- Do they tolerate mistakes?

- Are they kind and compassionate when that demeanor may be necessary?
- Do they treat all their team members the same?
- Do they encourage their team members to improve themselves so they can reach their potential?

How committed leaders are to these principles will determine how strong the cloth (or the organization) will be. Poor leaders—leaders who do not treat their team with respect—will weave a piece of cloth that is prone to wear and tear. Leaders who respect their team and are interested in their success will weave a beautiful piece of cloth, or perhaps a piece of tapestry, that is strong.

Additionally, a good leader may find that the weave he is creating with his various leadership principles may need to be improved. So, he decides he needs to make some modifications to his principles. For example, he may decide he needs to meet with his team more frequently or that some members of his team require a bit more personal counseling or training.

Many leadership experts refer to leadership as an art. What worked to support one group may not be the best approach for the next. In other words, to stay with our thread analogy, a leader may have to modify the threads (principles) he is using to lead his unit. Modifying leadership methods is perfectly acceptable. In fact, it demonstrates that a leader is engaged with his unit and sees a need possibly to change how things get accomplished.

Good leaders are creative and innovative. They look for ways to better engage their team. Ultimately, effective leadership improves a company's bottom line, or in the case of a military unit, improves its readiness to go into harm's way. A military unit may not be able to show a financial bottom line, but it can show other meaningful data—high morale, good promotion numbers, and re-enlistment requests.



Sailors working to maintain their physical fitness. Courtesy of DVIDS, Photo by Petty Officer 1st Class Darren Moore

Conclusion

Leadership is the key ingredient to the success of any organization or unit. Leadership means influencing, motivating, inspiring, and helping others to do their best to help the unit succeed in meeting its goals. People bring different skills and abilities. Good leaders understand the advantages and value this brings to the unit.

Critical Thinking

New Vocabulary

advancement exam
bottom line
chain of command
Chairman of the Joint
Chiefs of Staff
cognizant
demoralizing
department
deployment schedule
division
end state
iteration
NROTC or OCS
Secretary of State
subordinates
superintendent
U.S. Naval Academy
U.S Pacific Command

1. What values and character traits do you feel you need to develop if you are to improve your leadership skills?
2. Arthur Imperatore, the retired chairman of the board and president of the A-P-A Transport Association, says that he tries to bring out the best in people, to teach them that they're bigger than they think they are. (Alger 2005) How does Imperatore's philosophy relate to some of the leadership principles we learned in this chapter?
3. What components of leadership do you think are the most important?
4. When we speak of leaders, think about some individuals you have personally known whom you would place in that category. Why do you look upon them as leaders?
5. We talked about leaders recognizing and connecting the variety of gifts that people on a team or organization bring to the table. How important is it that leaders recognize this concept for the organization or unit to succeed?
6. Are there individuals who were supposed to provide leadership to you or your organization who have disappointed you? Why?
7. What was your reaction to the chart Ms. Lessing found that compared being a boss versus being a leader?
8. Whom do you feel represents good leadership on the local, national, or global stage? What leadership traits does this individual possess? This individual can be a political leader, a sports figure, an entertainer, or anyone else whom you feel represents good leadership.

Study Guide Questions

1. What are the three key skills a leader must possess?
2. General Colin Powell collected 13 important leadership rules he aspired to. Select the one below which was not part of this collection.
 - (A) Have a vision. Be demanding.
 - (B) Adhere to strict policy guidelines to ensure you are doing the correct things.
 - (C) Be careful what you choose: You may get it.
 - (D) Avoid having your ego so close to your position that when your position fails, your ego goes with it.

3. Which of the following are elements of good communication?
 - (A) Communicating the end goal to your unit.
 - (B) Listen to feedback from your unit.
 - (C) Communicate only when they need to know and only information relevant to the issue at hand.
 - (D) Discuss why a decision was made.
 - (E) Stick to the reporting hierarchy and don't discuss issues that don't directly affect them.

4. List any three guiding principles developed by Admiral Charles Larson for the Naval Academy.

Essential Leadership Tenets

What You Will Learn to Do

We have discussed a number of leadership principles that proven military leaders have learned, developed, and honed over their careers. As we also discussed, it's a good idea to develop some of your own principles, or if you see some others that strike you as either positive or negative, to file them in your own leadership lessons file.

In this chapter you will learn essential leadership tenets, as well as additional leadership principles, that I have learned over my career. Sharing them with you can be helpful to your personal and professional growth as a leader. These principles can help a leader in any organization—private business, government, non-profit, military, or volunteer.

Skills and Knowledge You Will Gain Along the Way

- ✓ Understand how empowering the people that work for you can give them confidence.
- ✓ Learn how showing trust in your team will also give them confidence.
- ✓ Appreciate how showing an interest in your team and looking out for them can pay huge dividends.
- ✓ Become familiar with why poor performers cannot be tolerated.
- ✓ Listening to your subordinates; being decisive; and maintaining your integrity and honesty are also critical leadership components.



For everyone to succeed officers must empower the Navy's chief petty officers who in turn must empower their Sailors.
Courtesy of DVIDS, Photo by Petty Officer 2nd Class, Sonja Wickard

Introduction

In addition to supporting the principles we have outlined earlier, here are a few other **tenets** that I think are important. Some bear repeating because they are that important.

New Vocabulary

tenets—
a principle or belief

Empower the People that Work for You

Empowerment gives your team members confidence in themselves. Let them know that when you are empowering them to do a job, you are doing so because you have faith in them, and you will not let them fail.

I remember hearing a government executive once say that leaders should let team members “fall over the cliff and fail with an assignment.” This is NOT the correct approach to leadership. Making mistakes is acceptable and should be tolerated, but a good leader monitors subordinates and allows them to do a task. A good leader will never allow that subordinate to fall off a cliff. That team member and your entire team need to know you have their back.

Trust Your Team

Trusting your team members will give them confidence, and it will also generate loyalty. I believe loyalty is a critical component of an organization’s health. I once considered hiring someone to be my deputy. One of my subordinates said that Person X was smarter than the individual I wanted to hire, but I questioned Person X’s loyalty to the organization—and to me—when or if the going got a little rough. My subordinate said that in his opinion, someone who is smart is better than someone who is loyal. I do not subscribe to this philosophy. Loyal team members will always tell you what you need to hear as a leader—not what you may want to hear. I am never confident in the motives of a person who may not be loyal to you, your organization, or both.

In the Army there is a training culture and habit of what is called a “**foot stomp**” moment. The instructor in a class actually stomps their foot and says a “foot stomp” item—something you do not want to forget. So, I will stomp my feet and say again that loyal team members will always tell leaders what they *need* to hear, not what they *want* to hear. Good leaders will welcome this type of **candor**.

New Vocabulary

“foot stomp”—
a way to highlight important information
candor—
unreserved, honest, or sincere expression



Note

You should never be prone to hiring self-serving individuals—individuals who are more loyal to themselves than to you and the organization.

New Vocabulary

penchant—
*strong or habitual liking
for something or
tendency to do
something*

If You Assign a Project, Assign it to One Subordinate—Not Two or Three

Some leaders have a **penchant** for assigning the same project to two or three individuals. Unbeknownst to the subordinates, the leader is trying to see who comes back with a completed effort the soonest. When the subordinates learn what the leader has done, they become deflated and angry—and rightly so. The leader has caused a morale issue and dug themselves into a hole that they may not even realize.

These are the same type of leaders who thrive on creating an atmosphere of fear. Unfortunately, this type of environment hurts creativity and collaboration—some of which could benefit the organization or unit.

Be Honest and Direct with Your Team

One of the things subordinates want is feedback. What are the qualities that make them strong performing team members? What are their weaknesses? What can they improve upon to be better people and members of the team? Too often, leaders are afraid to provide criticism of their subordinates. Even during annual performance review sessions, leaders only speak of all the positive things.

New Vocabulary

constructive criticism –
*a helpful way of giving
feedback that provides
specific, actionable
suggestions*
kudos—
*praise and honor
received for an
achievement
(congratulations)*



Feedback on a regular basis is essential for the success. Courtesy of iStock, Credit Fizkes

Leaders can often shy away from offering even **constructive criticism**. The time to offer that criticism, however, is not during annual review periods. A good leader will offer guidance, direction, and help throughout the year—not just at mid-year review or final appraisal time. You will be surprised how much constructive criticism or guidance is welcomed. Constructive criticism can always be mixed with **kudos** to soften possible impact.

Do Not Tolerate Poor Performers

One of the worst things leaders can do is continue to tolerate poor performers. Most high performing team members do not want them on the team or in the unit.

Take action with poor performers. If it means their behavior must be documented to take action, do it! Poor performers are a drain on the team and result in lousy morale, a "cancer," that affects good performers. Not taking action on poor performers will ultimately reflect on you, the leader. The effectiveness of the team—its performance, creativity, and agility—will suffer.

Taking action will send a positive signal to your good performers that you care about them.

Do Not Forget to Pause and Say the Little Things to Good Performers

Small words of praise or expressions of interest go a long way. Examples:

- “Great job.”
- “Thank you for sharing your idea at our last meeting. I’m going to consider it.”
- “What are you working on today?”
- “How was your **leave**? What did you do?”
- “How’s that evening course you’re taking? Are you enjoying it? How close are you to graduation?”
- “How’s the baby? And is your wife doing okay?”

New Vocabulary

leave—
permission to be away from one's unit

Maintain Your Integrity and Honesty

Be honest with your subordinates and be everything you want them to be. Your unit or organization should have a set of **core values**. Abide by those values and show commitment to them. If subordinates know you have a family and witness that you are having an affair, then you have dug yourself into a hole—at least with some of your team members. You have lost their respect.

A trusted colleague once shared a situation with me that spoke volumes about how a leader carried himself. My friend found himself in a situation where his immediate boss was having an extramarital affair. It occurred to him that not only did he now have a lack of respect regarding his boss, but he also felt he could no longer trust him. He said, “If he is going to lie and cheat on his wife, then what’s to keep him from treating me the same?” My friend said he always kept an eye on his boss to avoid being **collateral damage** because of the boss’s untrustworthy behavior.

It's important to maintain integrity. If you say you are going to do something, do not just offer lip service to your team. Do it, or at least try to get it done. Follow through on your commitments. If you cannot get it done, explain to your team why you were unable to accomplish the task. Even if you were unable to act on an issue, providing feedback to your team will build trust that you at least tried.

New Vocabulary

core values—
the deeply ingrained principles that guide all of a company's actions; cultural cornerstones
collateral damage—
injury inflicted on something other than an intended target



Navy's leadership relies upon everyone on the team to hold themselves to the highest standards with core values that honor the country, their service, and their shipmates. Courtesy DIVDS, Courtesy US Navy, Photo by PO1 Todd MacDonald

Be an Effective Communicator

New Vocabulary

goals and vision—
*vision is a clear image
how you see your future;
goals are set as a specific
target that move you
toward your vision*

Hopefully, your team members understand the **goals and vision** of the organization. Nevertheless, what are your goals and vision for the team? Share them and share how your team can meet them. Communicate your goals and visions clearly. You'll not only avoid misunderstandings, but you'll also earn respect through your honesty and clarity and have a greater chance of accomplishing your goals.

When you meet with your leaders in your chain of command, provide feedback from those meetings to your team. This allows your people to feel connected about knowing what is going on. By sharing information, you are also saying you respect and value them.

Be an Ardent Listener

New Vocabulary

ardent—
*enthusiastic or
passionate*
objectively—
*not influenced by
personal feelings or
opinions*
apprised—
informed or to tell others

Being an **ardent** and active listener is an important element to being a good leader. This is because communication isn't just about what you say. If you want people to listen to you, you need to listen to them. Don't get so focused on what you're saying that you miss their important comments, emotions, and reactions. Listen and process what they're trying to communicate to you. Letting people share their ideas while you respectfully receive them is crucial and sends a powerful signal to your team. It says you respect your team members and value their ideas. When everyone is actively involved, communication is far more effective.

There is often more than one way to do a job and it's likely the idea to do it another way comes from a member of your team—if you listen **objectively**. However, you need to not only listen but also act on those ideas. If an idea does not work, you need to say why. On the other hand, if an idea has merit, you need to follow through and not let it linger unaddressed. Keep your team **apprised** of its status.

Be Decisive

Being a leader means having to make decisions, but subordinates do not necessarily welcome all decisions. Leaders must accept the fact they are not going to please everyone. The worst thing a leader can do is to be wish-washy and unable or unwilling to make a decision. Leaders will often try to build a **consensus**, perhaps buying time in the hope a problem or issue will go away. That does not work. It only builds resentment and causes a leader to lose his team's respect.

New Vocabulary

consensus—
a general agreement

Career Spotlight

Major General Jason Q. Bohm

Commanding General, Marine Corps Recruiting Command



Leadership is everchanging, as each generation is stimulated and motivated by something different. This is how Major General Jason Bohm has successfully commanded his people throughout his military career.

As a lover of history with a sense of duty, Major General Bohm was commissioned a Second Lieutenant in May 1990, upon graduating from the NROTC Program at the Illinois Institute of Technology. He has had the honor of commanding at many levels but considers himself an infantryman by trait. He has expressed that “Everything I have is because the military provided me with the opportunity to live up to my potential and goals in life.”

Throughout his command, Major General Bohm has maintained the philosophy that to be effective, your leadership message needs to be concise, memorable, and impactful. Over the years, he has developed and refined his command philosophy, which he calls the “Fightin’ Five Principles.”

These principles are:

1. Mission Always Comes First – commit to the roles and responsibilities in your life, whether military, professional, or personal, and dedicate yourself to accomplishing those missions.
2. Lead by Example – set the standard based on your words and deeds, and remember, everyone has the power to set the standard, not just the most senior in an organization.
3. Have Balanced Excellence – strive to be successful in all areas; be flexible and adaptable.
4. Constantly Seek Self Improvement – never be content with the status quo; face your weaknesses and turn them into strengths.
5. Be a Person of Honor and Character – do nothing illegal, immoral, or unethical.

In his current role at Marine Corps Recruiting Command, Major General Bohm loves to help people make more of themselves. By determining what is important to them—whether it be money, travel, adventure, courage, poise, self-confidence, or pride of belonging—he can identify how the Marine Corps will provide that to them. He is very proud to see young men and women meet their potential.

“Every one of you has enormous potential waiting to be tapped. It’s just a matter of whether you have the gumption to get after it. Serving in the United States military will help you live up to your full potential, both personally and professionally. There is no civilian institution that can provide you with the same life experience as you will gain by serving in the military.”

Conclusion

Leadership encompasses numerous forms and entails many elements. In essence, it all comes down to people. How you manage them; how you care for them; how you treat them; how you communicate and talk to them; and how you inspire them. These elements will help your organization make an impact.

Trust your team. Let them run, allow them to make mistakes and learn from those mistakes. Demonstrate trust by giving them responsibility. Empower your people. Then watch and monitor them as they complete the tasks you have assigned. Coach along the way and be supportive by reminding them you want them to succeed.

Critical Thinking

1. Having a mentor is a large part in any leader's personal and professional development. Joseph E. Robert, the former chairman and CEO of J.E. Robert Companies, says: "For every turning point in my career, there has been a mentor behind the scenes with a hand on my shoulder." Have you ever had a mentor? What did they provide you? As you grow both personally and professionally, what would you expect your mentor to provide you?
2. Why do you think that communication is probably the most important element of being a leader?
3. What do you think are some advantages of being engaged with your subordinates?
4. What are some ways in which you can show trust to members of your team?
5. Have you ever been part of an organization that has poor performers? What has leadership done (or not done) to solve the problem?
6. What are your core values that you live by?
7. Why is maintaining your integrity and honesty important? What happens to leaders who fail to live up to these elements?

New Vocabulary

apprised
ardent
candor
collateral damage
consensus
constructive criticism
core values
"foot stomp"
goals and vision
kudos
leave
objectively
penchant
tenets

Study Guide Questions

1. What is considered the least important word?
2. List 5 of the leadership tents?
3. What do you need to do if you want people to listen to you?
4. As a leader, what are you conveying to your team when you are a good listener?
5. What type of criticism can be helpful?
6. How do you empower your subordinates and give them confidence?

Examples of Good and Poor Leadership

There are countless examples of both good and poor leadership in the military, civilian, and government sectors. We can certainly learn from them as we develop our own leadership styles. We have provided some examples below that will hopefully allow you to grow.

What You Will Learn to Do

In this chapter you will read some actual examples of good and poor leadership. You will see some of the leadership principles being practiced (or not being practiced) that we discussed in Chapters 1 and 2.

Skills and Knowledge You Will Gain Along the Way

- ✓ Understand the importance of communication.
- ✓ Understand the importance of listening to your subordinates.
- ✓ Recognize how getting to know your subordinates can pay dividends, including building trust.
- ✓ Learn to have the courage to act and do the right thing when you see a problem.



There are countless examples of both good and poor leadership in the military, civilian, and government sectors. Courtesy of iStock, Credit XtockImages

How USS *Santa Fe* Went from Being the Worst Ship to the Best

Commander L. David Marquet, a nuclear-trained submarine officer, was preparing to take command of USS *Olympia*, a Los Angeles Class submarine. He had been training for about 12 months as he awaited this opportunity. The Navy refers to the process of preparing for command as “being in the pipeline.” (Marquet 2012, p. 11)

With very little notice, Marquet was told that plan was not going to happen. He was being assigned to command a different fast attack submarine, USS *Santa Fe*. Marquet quickly learned the reason for the change in assignment. *Santa Fe* needed help—help in the form of leadership.

The commanding officer of *Santa Fe* abruptly quit. The ship itself was the laughingstock of the fleet. When Marquet learned of his assignment, he said the ship had only two problems: the fleet’s worst morale and its worst performer. (Marquet 2020, p.3)

Each month, the Navy would publish the 12-month re-enlistment and retention rate for the approximately 50 submarines in the fleet. *Santa Fe* was always at the bottom of the list. Ninety percent of its crew would choose to exit the Navy at the end of their time onboard.

The other problem, Marquet learned, was the ship’s bad performance. *Santa Fe* was getting poor inspection scores across the board—from food service to torpedo firings and from navigation to its nuclear power plant. The number of safety incidents was also troubling.



USS *Santa Fe* returns to port in Pearl Harbor, Hawaii. Courtesy of DVIDS, Photo by SA Luciano Marano

Complaints

Before taking command of *Santa Fe*, Marquet went aboard the ship to meet the current commanding officer and the crew. As he made his way through the submarine and greeted crew members in the two-foot wide passageways, all he received were grunts and mumbles with a lot of men looking down at the deck. There was no eye contact and certainly no conversation. Marquet instantly realized the ship had issues that were quickly going to be his to resolve.

The depth of the problems was reinforced when he sat down with the ship's officers and chief petty officers. What he heard was troubling: (Marquet 2012, p. 24)

- “The duty officers delay getting maintenance started.”
- “The junior officers are the source of low standards.”
- “I’ve been waiting for four weeks to get a test so that I can **qualify**.”
- “I was previously qualified for this watch station, transferred ship to ship, and now have to start over with a blank qualification card.”
- “The radio installation and upgrade we just received left us with less capability than what we had before.”
- “I was promised a certain job when I came here, and it hasn’t happened.”
- “I just keep my head down and try to stay out of trouble. When things go badly, I secretly hope someone else will screw up next.”

New Vocabulary

qualify–

for a Sailor to “qualify” for an area of an assigned watch means they know the purpose, responsibilities, and implications of successful watchstanding



Earning submarine qualifications and being able to wear the dolphin pin says you know and understand all your submarine's systems. Courtesy of DVIDS, Photo by PO1 Jennifer Villalovos

One chief petty officer told Marquet that he had asked to be transferred. The chief ran the fire control system on the ship—the critical system that sent targeting instructions to every missile and torpedo *Santa Fe* were to ever launch. This was partly based on the fact that the chief's annual performance evaluation was due on September 15, and it was December. The chief had a promotion board coming up, and the missing evaluation meant his file would be incomplete when he would be reviewed for promotion. Marquet wondered that if chief evaluations were being handled this poorly, how were the evaluations of junior enlisted personnel being handled?

Another chief, this one responsible for a nuclear division, told Marquet that no one had ever reviewed his equipment status log since his arrival. The equipment status log is a large database that includes details about everything that’s wrong with each piece of equipment the division owns. The log forms the basis of the maintenance and operational plans—key pieces of information needed for the safe operation of the ship’s nuclear power plant.

Drill Gone Wrong

The true turning point for Marquet came, however, when he took the ship to sea for training prior to an upcoming deployment. The training included conducting several drills.

One of the first drills was set up, and Marquet proceeded to the control room in the forward part of the ship where he observed the **officer of the deck (OOD)** and the ship control watch officers. The OOD was doing all the right things. As the drill continued, things appeared to be going well. So Marquet wanted to add another problem to the exercise. He suggested to the OOD that speed be increased from ahead one-third to ahead two-thirds, respective fractions of standard speed.

To comply with the captain’s suggestion, the OOD ordered, “Ahead two-thirds.” But nothing happened. The **helmsman** should have rung up the order for ahead two-thirds. Instead, Marquet saw him squirming in his seat. No one said anything, so Marquet asked the helmsman what was going on and why he hadn’t rung up the order.

“Captain, there is no ahead two-thirds on the EPM.”

Marquet applauded the helmsman and went to the OOD in a corner of the control room and asked him privately if he knew there was no ahead two-thirds on the EPM. The OOD said he did. When asked why he then ordered it, his response to the captain was: “Because you told me to. I thought maybe you had learned something secret at **PCO** school that they tell the COs (commanding officers) about.” Marquet contends that this is what happens in a “top-down culture” when the leader is wrong—everyone goes over a cliff. Marquet vowed to fix it.

What Marquet realized from the event was that he was making tactical and operational decisions for the team, and not making the crew responsible for the outcomes. More importantly, he was giving them a pass on thinking for themselves.



Leadership requires good communication. Success occurs when everyone is doing their part. Courtesy of iStock, Credit ALOfPeple

New Vocabulary

officer of the deck (OOD)—*designated by the commanding officer to be in charge of the ship when under way, including its safe and proper operation*

helmsman—*person who steers a ship, sailboat, submarine, or other type of maritime vessel*

PCO—*Pre-commissioning Officer; someone in the training pipeline or otherwise awaiting to assume command*

Intent and Outcomes—Not Orders

After the incident involving the OOD and the helmsman with the EPM during the drill, Marquet says he vowed never to give another order. Instead, he made a deal with his officers and told them he would provide intent—intent being the goal of whatever it was the ship and crew were trying to achieve. The officers agreed they would never wait to be told what to do. Instead, they would provide their intentions to him about how they were going to achieve his intent.

This shift was reflected simply in a change in language. Instead of “request permission to,” the language changed to “I intend to.” The change meant the officers and crew had to think and become engaged with their jobs.

Marquet, as the captain, knew everything started with him—how he spoke to the officers and crew and how they spoke to him. Marquet knew the key to leadership was communication.

One of the many things Marquet always believed is that as a leader, he couldn’t remain quiet because then people wouldn’t speak up. But he finally realized that people weren’t speaking up because he couldn’t remain quiet.

He also learned that waiting for people to prove themselves in order for him to trust them was backward thinking. He realized he needed to entrust people with authority and **autonomy** to give them the opportunity to prove themselves. For example, Marquet saw a value in asking the kind of questions that encouraged people to share their thoughts—some of which were better than his own.

Changing how everyone communicated with one another and giving people more autonomy over their work changed the ship in a profound way. Marquet learned that by giving people autonomy over their work, they become connected to a purpose that mattered. His crew, both officer and enlisted, felt like they were part of a team. Marquet said he felt *Santa Fe* went from being a ship with one leader and 134 followers to 135 leaders with a bias for action and thinking.

Over the next 12 months, *Santa Fe* set a record when every one of the 33 Sailors eligible for reenlistment signed up to stay in the Navy! Ten officers from Marquet’s command were selected to command submarines themselves. Five of them became squadron commanders and at least two have been promoted to admiral. The ship performed brilliantly in every task the Navy asked of it and even received an all-time record inspection score for operations.

Santa Fe had gone from worst to first and stayed that way after Marquet successfully completed his tour of duty as its commanding officer.

New Vocabulary

autonomy—
the quality or state of being self-governing, being moral, and personal independence



Nothing better than Sailors from any command returning home after a successful deployment. Courtesy of DVIDS, Photo by PO2 Tristan Lotz

The Role Navy's Leadership Played in a Rash of Collisions at Sea

In 2017, the Navy suffered two fatal ship collisions that resulted in the deaths of 17 Sailors. In separate incidents, two **guided missile destroyers**—USS *Fitzgerald* and USS *John S. McCain*—collided with commercial vessels in the Western Pacific.



Note

Prior to these collisions, two Pacific Fleet cruisers also had accidents, although non-fatal. One cruiser—USS *Antietam*—went aground and another—USS *Lake Champlain*—collided with a South Korean fishing boat.

The **Chief of Naval Operations (CNO)** ordered a review of the accidents to specifically look at a range of issues that included individual training and professional development; development and certification of operational standards for deployment; and **material readiness** of systems aboard ships. The report concluded that the two fatal collisions were avoidable. In both collisions, the Navy found numerous failures by the crews and commanding officers of the ships. (Starr) These failures included not following standard navigation and seamanship practices, and poor situational awareness of what the ships were facing as they navigated through very busy ocean routes off Japan and Singapore.

Specifically, the review found that in all four incidents, when the crews were faced with an extreme situation, they delayed actions, froze, and did not alert their shipmates of imminent danger. (Larter) Also, the report noted that teamwork was, at times, non-existent between the bridge and the ships' *combat information centers (CIC)*. CIC is where all information from a ship's sensors and weapons systems are displayed and synthesized.

New Vocabulary

guided missile destroyers—

surface ships that are capable of engaging targets on, above or, below the surface

Chief of Naval Operations (CNO)—

the senior military officer responsible for the command, utilization of resources, and operating efficiency of the shore activities and operating forces of the Navy

material readiness—

the availability of material required to support its wartime activities or contingencies



The USS John S. McCain has since been repaired after colliding with a merchant vessel in 2017. Courtesy of iStock, Credit viper-zero

Leadership at Many Levels Was Found to Be Lacking

In the report ordered by the CNO, referred to as the *Comprehensive Review of the Surface Navy*, it was found that leadership at the U.S. Seventh Fleet headquarters (led by a three-star vice admiral) and by ship commanding officers allowed training and proficiency to erode as they tried to keep ships underway and meet operational requirements. (Larter)

The **operational tempo** in the Pacific Fleet was very high due to the **geo-political situation** in the region. The growth of China's navy, in both size and capabilities, had led to a robust U.S. naval presence to meet this threat. Meanwhile, the U.S. was also trying to meet operational commitments in other regions of the world. For example, the U.S. was seeing a **resurgence** in the growth of the Russian navy. Tensions in the Middle East had also grown, leading to an increased requirement for a presence in that region as well.

Unfortunately, because of budget cuts that had been occurring, the size of the U.S. Navy was reduced markedly. In fact, at one point in the 1980s, the manning of some ships was reduced to save money. However, over a long period of time, Navy leadership was increasing the number of operational missions assigned to them, particularly in the Pacific. To meet operational requirements, training and maintenance were unknowingly not completed as they should have been.

"The risks that were taken in the Western Pacific accumulated over time..." the report said.

The term that was used in the report was that the problem had become **insidious**, meaning it proceeded to build in a gradual way—but with some long-term harmful consequences.

New Vocabulary

operational tempo—the demands of operations upon people and equipment
geo-political situation—study of the influence of such factors as geography, economics, and demography in assessing foreign policy of a state/government at a point in time
resurgence—a rising again into life, activity, or prominence
insidious—proceeding in a gradual, subtle way, but with harmful effects

“The dynamic environment normalized to the point where individuals and groups of individuals could no longer recognize that the processes in place to identify, communicate, and assess readiness were no longer working at the ship and headquarters. In every mishap, departures from procedures or approved customary practices were deemed to have directly contributed to the mishaps.”

~Comprehensive Review

In addition to a lack of attention to training and maintenance requirements, another significant fallout from a high-operating tempo and a lack of training was human fatigue arising from excessive working time or poorly designed shift patterns. As one retired officer said, “A ship that spends too much time at sea tends to get an exhausted crew.” (Starr) He added that “without training time, **perishable skills** atrophy. Ships’ crews get a tendency to be good only at steaming from point A to point B. The things that are most dangerous to you are things that you’re only going to do one percent of the time.”

New Vocabulary

perishable skills—*critical skills that are not practiced on a regular basis decline*



The Navy in Yokosuka, Japan, conducts a memorial service for the ten USS John S. McCain Sailors who died following the ship’s collision at sea. Courtesy of DVIDS, photo by Christian Senyk

New Vocabulary

operational cycle—
an Optimized Fleet Response Plan/Operational Cycle for manning, training and deploying its ships
replenishment operations —
a broad term applied to all methods of transferring fuel, munitions, supplies, and personnel from one ship to another while the vessels are underway

What Are the Leadership Lessons to Be Learned from These Accidents?

When you are in a leadership position, it's sometimes difficult to say "no" to a request. There are only so many ships and Sailors that can be made available in an **operational cycle**. Sometimes time must be set aside for crews to train on their equipment, to master its operation and maintain it, and to learn their own limitations. It clearly takes time and repetition to master tasks, such as:

- Navigating in heavily trafficked waters.
- Practicing ship handling skills required in underway **replenishment operations**.
- Anchoring.
- Practicing how to safely make an approach to a pier.

As the *Comprehensive Report* showed, failure to commit to make readiness a priority will inevitably reproduce mistakes of the past.

In the Pacific Fleet area of responsibility (AOR), it may be difficult for Navy leaders to say, "We can't meet this requirement," when our political leaders may ask the Navy to observe the Chinese navy conducting a major exercise with some new ships. Would it prove to be advantageous to do this? The answer is probably "yes." On the other hand, if the only available ship is one that just came out of a shipyard maintenance period and has many newly reported crewmembers onboard, it's probably not the right decision to say, "Yes. We can meet this request." The crew of that ship is obviously not trained and not ready to go to sea.

Sometimes leaders must be realistic and accept the reality that restoring the readiness of the fleet is a priority and that saying "no" is acceptable. Leaders must never lose sight of what is right and to accept altered standards. To do so, especially on a continuing basis, leads to accepting lower standards as a new normal.

What Are the Risks of Saying "Yes" When the Answer Should Be "No"?

Leaders must also never allow a culture to develop where there is an acceptance of operating beyond the boundaries of established standards. The accidents that occurred demonstrated that risks were taken and there were initially no consequences. If the ships had operated successfully previously, then the risk was acceptable. Unfortunately, what develops from this mentality is a departure from a questioning culture. When a questioning culture is lost, leaders are prevented from stepping back and assessing the risks from insufficient training, for example.

The four accidents demonstrated that Navy leaders accumulated greater and greater risk to accomplish the missions they were ordered to do. What resulted, unintentionally, was an incorrect perception of the fleet's state of readiness. In essence, the level of crew proficiency and problems with readiness were missed at headquarters, and over time, accepted as the new norm. Up to the point of the accidents, the four ships had been performing with good outcomes. This reinforced trusting past decisions about training and maintenance practices.



Note

The departure from a questioning culture prevented leaders from stepping back and perceiving the risks that were accumulating.

All leaders—whether they be **flag officers**, commanding officers, the most **junior officer**, or a **petty officer**—need to understand, develop, and foster a climate that empowers all individuals to provide forceful feedback to the chain of command. Leadership should encourage, for example, an atmosphere that says, "If we're going

New Vocabulary

flag officer—
admirals or generals
junior officer—
ranks from ensign to lieutenant
petty officer—
enlisted ranks from E4-E6 and Chief Petty Officers ranks of E7-E9

to go into harm's way, this is not good enough. We really don't know how to use this piece of equipment quite yet. We need some more training.”

Big Navy Looking at Itself Across the Globe as to How it Operates

While the *Comprehensive Review* (CR) was being undertaken, a broader review had been ordered by the Secretary of the Navy. Called the *Strategic Readiness Review* (SRR), its findings reinforced the *Comprehensive Review*.

While the *Comprehensive Review* looked at the Seventh Fleet and provided some excellent insight into how the accidents occurred and what need to be done to correct deficiencies, the *Strategic Readiness Review* looked at the situation from a broader perspective. It examined the conditions of the last 30 years that allowed the entire Navy's readiness state to get to where it is today. Although decisions made over the past 30 years were all well-meaning, the same results of trying to do more with less have resulted in some negative consequences—primarily an incorrect assessment of the fleet's readiness.

To correct this deficiency, the SRR report echoed the CR in calling for accepting a learning culture—not just at the fleet or shipboard level but at the most senior levels. A learning and questioning culture allow for sound policy decisions and processes. This type of culture can prevent decisions that lead to poor outcomes.

The two reports identified numerous problems that led to the accidents. Now it was in the hands of the Navy's most senior leadership—the **Secretary of the Navy**, the Chief of Naval Operations, and the **Commandant of the Marine Corps**—to ensure all the issues identified in the reviews were acted on.

Just a couple of months after both the CR and the SSR were completed, a Readiness Reform Oversight Council (RROC) was formed. The RROC reported directly to the Secretary of the Navy, Chief of Naval Operations, and Commandant of the Marine Corps. The RROC's charter was to oversee the combined reforms and recommendations that came out of the CR and SRR. In early 2019, just over a year after the CR and SSR reported their findings, the RROC synthesized the recommendations contained in both reviews.

One of the most significant items that came out of the RROC's first report was its citing of how the Navy was moving to prioritize manning in supporting operational requirements—ensuring the ships that deployed did so with the proper number of personnel so that it could operate safely and effectively. The RROC also reported that the Navy had removed 63 inspections and certification visits that allowed commanding officers more time for training and maintenance.

Doing More with Less Impacts More than Just the Navy

More significantly was how this feedback empowered the four-star admirals who oversaw the fleets. One fleet commander said adding the new **touch points** with lower-level commanders increased awareness of fleet readiness that in turn increased trust between fleet commanders and combatant commanders. **Combatant commanders** are four-star admirals or generals that oversee a specific geographic region of the world. If a fleet commander said he cannot deploy a ship, the combatant or theater commander trusts that decision is in the best interests of the Navy.

The bottom line is that Navy leadership did not simply place the recommendations of the CR and SSR on a shelf. It recognized it had serious problems that had to be addressed. When leadership has this attitude, it says it must take ownership of the problems—challenge standards, behaviors, and thinking that have become the norm—and embrace the changes required for success.

New Vocabulary

Secretary of the Navy—(SECNAV) is responsible for conducting all the affairs of the Department of the Navy, including: recruiting, organizing, supplying, equipping, training, mobilizing, and demobilizing
Commandant of the Marine Corps—normally the highest-ranking officer in the United States Marine Corps and a member of the Joint Chiefs of Staff

New Vocabulary

touch points—any interaction, including encounters where there is not physical interaction
combatant commanders—the Defense Department has 11 combatant commands, each with a geographic or functional mission

There is a phrase that identifies a necessary leadership quality. The phrase is, “Before a problem can be solved, you must first recognize you have a problem.” In this case of the four accidents, Navy leadership in essence said, “We have a problem so let’s go see what we have to do to fix it.”

It’s not unusual for organizations to examine issues and seek solutions to problems. However, many of those examinations wind up as well-written documents that are placed on a shelf to gather dust. Good leadership, as evidenced by the actions the Navy has taken, has not allowed that to happen.



Good leadership provides the ability for all to speak up when team members see problems. Courtesy of DVIDS, Photo by Alonzo M. Archer

A Shipboard Suicide and How It May Have Been Prevented

I was a junior officer aboard my first ship in 1972. We were deployed to the Seventh Fleet and were operating in the Gulf of Tonkin to support bombing operations off North Vietnam. I had just completed standing a bridge watch from midnight to 4 a.m. — also known as the dreaded 0000-0400 mid-watch. I was in my stateroom, trying to get a little sleep before I began my division officer duties in a few hours.

I was suddenly awakened with a lot of commotion in the passageway outside my **stateroom**. There were a lot of voices which was quite odd at that hour of the day.

I climbed out of my bunk and opened the stateroom door to find a large group of people around a room down the passageway. The large group included medical personnel whom I recognized. I asked what was going on and quickly learned that a young Sailor had hanged himself in the room. I later learned the Sailor was a member of my department but not my division.

When I learned his identity and where he worked, I became very upset because I felt the Sailor’s actions could have been prevented. I knew the Sailor’s division officer. He was a peer whom I had very little respect for. Instead of paying attention to the men in his division, he ignored them. He spent most of his time in his stateroom and the

New Vocabulary

stateroom—
cabins functioned as
sleeping quarters,
lounges, and offices

wardroom—
the dining or mess area
assigned to officers

wardroom. He never met with his division and took very little interest in getting to know them.

The 1960s and 1970s was a very difficult time for the both the nation and the military, primarily because of the Vietnam War. The military draft had just recently ended but a lottery system had been instituted. So, there were a lot of people who joined the military because they felt they had to. It was not the best time to be in the military. The military did not enjoy the respect it does today. In fact, many citizens disrespected it as they blamed the military for the failures that came from the Vietnam conflict.

Some of that unhappiness was evident in our Sailors. Some simply did not want to be in the Navy. Some had joined because they were ordered to by the courts after becoming involved in criminal activity. (We'll discuss one such Sailor in a subsequent section).

Regardless of whether a Sailor wanted to be in the Navy or not, he was a Sailor and deserved to be supported. My feeling was that if my peer was doing his job, he could have perhaps sensed a problem with his Sailor. What did my peer know, if anything, about the Sailor? Was the division officer's Leading Petty Officer (LPO) aware of an issue with the Sailor? Was the division officer even engaged with his LPO? Was the Sailor having problems at home? Was he married? What were his stresses?

To make matters worse, our department head was not a good officer or leader either. He was not engaged with any of us. If he was displeased with the performance or professionalism of my peer for not being engaged or caring about his people, he neither showed it nor expressed any concern about it.

This is why I was angry. It is also why I vowed never to model myself after neither my department head nor my division officer peer.

Could the suicide have been prevented? We'll never know the answer. But it caused me to pay even more attention to my crew, learn more about their role in the division, and even more about them personally.



A successful leader knows their Sailors, their family status, hometown, and why the Sailor is key to the success of the command. Courtesy of DVIDS, Photo by SA Zachary Guth

How Leadership Led to the Discovery of a Weapon Onboard a Ship

New Vocabulary

lee helmsmen–

assistant or relief helmsman; usually operates engine order telegraph

quarters–

a daily meeting with face-to-face communication to ensure all Sailors are where they are supposed to be, share information, routine inspections and a time to recognize good performers

As a division officer, I made it a point as part of my regular routine to meet with my people every morning, except when I was standing a bridge watch. Even if I was standing watch, many times some of my people would also be standing a bridge watch as helmsmen or **lee helmsmen**. The bridge watches were also a good time to get to know them when there were operational lulls. The morning meetings at **quarters** were also a good time to inform them of our schedule, upcoming port visits, and oftentimes to dispel rumors about our schedule and things going on about the ship.

I also committed myself to conducting regular locker inspections in the berthing compartment where my Sailors lived and slept. First and foremost, I wanted to ensure the compartment was clean, especially the heads, or bathrooms. Inspecting the lockers allowed me to look for contraband such as alcohol and drugs. I never thought I would find myself looking for a weapon.

While I was inspecting the lockers in the compartment one afternoon, a Sailor who was in an upper bunk caught me a bit off guard.

“Hey, Mr. J, are you looking for the gun?”

“What are you talking about?” I asked.

“Yeah, Seaman Jones was showing off his gun last night. He put it back in his locker.”

I was in disbelief, because I thought I had made a very thorough search of all items in the locker. However, I was not able to find a gun.

I spoke to several Sailors in my division the next day about Seaman Jones. Some confirmed what I was told. They, too, had seen the gun. Interestingly, when I informed my LPO about what I was hearing, he told me he had been threatened by the Sailor. The Sailor told my LPO that he had a “bullet with his name on it.”

So, I immediately went back to the compartment and conducted another search. This time I found it. The Sailor had a trumpet in a music case and hid the gun behind a piece of felt in the top lid. I confiscated the gun, of course, and brought it to the ship’s Master at Arms (somewhat equivalent to the ship’s chief of police). We both proceeded to the ship’s lawyers who prepared the necessary paperwork to go to a Captain’s Mast (basically a disciplinary hearing before the ship’s captain). He immediately referred the matter to a **court-martial** which would be convened at the Subic Naval base in the Philippines.

New Vocabulary

court-martial–

a legal proceeding for military members that is similar to a civilian court trial. It is usually reserved for serious criminal offenses like felonies



Inspections of berthing spaces are an essential part of ensuring health and safety onboard ship. Courtesy of DVIDS, Photo by PO1 Geronimo Aquino

The Sailor was clearly not a model citizen. In fact, I had learned he was charged with a felony crime (car theft) in his hometown. After being found guilty, the judge supposedly gave him an ultimatum—serve time in jail or join the military. He obviously chose the latter. This is what made the military challenging at the time. The draft had ended, the Vietnam War was still going on, and the military needed manpower. Law enforcement and the civil legal system thought they were, perhaps, helping the military with its recruiting challenges. As well-intentioned as they may have been, they were not being helpful.

While aboard ship, the Sailor had amassed a lengthy list of disciplinary issues. The possession of a firearm in his personal items was the most serious. When we arrived in Subic Bay, the last thing I wanted to do was to spend time at a court-martial proceeding. We had been at sea for about two months operating in the Gulf of Tonkin, and I was looking for some “down time” along with other crewmembers.

Without going through all the details of the court-martial, suffice it to say the gun-possession charge was dismissed. It was most disappointing. A ship’s instruction permitted me as a division officer to conduct a locker inspection once a month. Because my second inspection was conducted just one day after the first, it was ruled illegal. The defense lawyer representing the Sailor contended that I should have gone to the ship’s lawyer and obtained a search warrant based on “probable cause.” The defense lawyer was right. I learned an important lesson.

It was most disappointing, but I learned an important lesson about being prepared and coordinating with lawyers on such matters. I should have read the instruction on conducting locker inspections before going into his locker the second time in two days. Nevertheless, the Sailor was found guilty on numerous other offenses and was sent to the **brig**. We never saw him again on our ship.

Would the Sailor have shot my LPO or anyone else in the division? Thankfully, we never found out. However, I was most grateful to that Sailor in the top bunk who alerted me to the gun that he saw, along with the other Sailors in my division who confirmed that they had also seen the weapon. I firmly believe it was the trust and

New Vocabulary

brig—
a naval military prison on a ship or navy base

confidence they had in me as a leader to alert me to the weapon. The daily engagements I had with my men led to the building of that trust and confidence. It had paid a huge dividend.

How Leadership Stopped the Physical Abuse of Shipmates

New Vocabulary

public affairs officer—
master of communication, defending the Navy and other services from misinformation and negative publicity

When I was assigned to the staff of the U.S. Naval Academy as the **public affairs officer**, Adm. Larson was the superintendent (equivalent to being the president of a college or university). As discussed in chapter one, he had identified some serious deficiencies in the Academy’s leadership curriculum. He felt the school had drifted too much and started to resemble a civilian school. He wanted it to return to being a school that developed leaders who would serve our nation as officers in the Navy and Marine Corps.

We felt we were making progress in this regard. We had invited the media to sit in on some leadership and ethics classes. We also permitted some media to visit Bancroft Hall (the largest college dormitory in the world) and allowed them to follow some midshipmen around on their daily routines. Adm. Larson always felt that leadership development started in Bancroft where midshipmen began to develop their own leadership skills and techniques. As it turned out, our decision to showcase leadership development in both the classroom and in Bancroft Hall paid huge dividends.

On a hot and humid Sunday afternoon in late July, I received a phone call from the Bancroft Hall duty officer. I remember the phone call going something like this: “Captain, we had a situation here in the hall that I wanted to inform you about. Everything is okay now, but we had some *plebes*, or freshmen, who were being exercised [push-ups, jumping jacks, squat thrusts, and so forth] by a second class mid [a junior] on the 4th deck. A couple of the plebes passed out, but they were taken to the medical clinic, and they are now back with their company. They’re all okay. A first class mid [senior] saw what was happening, and he jumped in and stopped the exercises immediately. He also called for medical help.”

As a matter of note, Bancroft Hall was not air conditioned at the time. So, one can only imagine how hot it was on the 4th deck of Bancroft Hall in Annapolis in mid-July.

I thanked the young officer for the information and hung my head in dismay. I told myself that we had a very serious problem on our hands. The Academy could withstand the scrutiny of a cheating scandal and some other disciplinary issues. However, the physical abuse of a trainee—another human being—was something that could not be tolerated.

I was deeply concerned because I knew this incident would become known to the media. The following day, my instincts proved correct. Within fifteen minutes of one another, I received phone calls from reporters at *The Washington Post* and *The Baltimore Sun* who learned about the incident the previous day. I told both reporters what happened—that a senior saw what was happening, immediately stepped in to stop the exercising, and called for emergency medical help. I also told them that the junior who was initially involved was disciplined for his actions.

Both reporters thanked me for the information and told me that they were not going to do a story on the event. They both independently informed me that the access we had provided to Bancroft Hall, along with the access to the classroom instruction on leadership and ethics, provided them some insight as to what Adm. Larson was trying to accomplish. Both reporters were especially impressed with the actions of the senior midshipman who stepped in to take control of the situation when he saw what was occurring. I did not have to remind the reporters that the senior’s action was an

example of the type of leadership that Adm. Larson was focused on developing. Allowing the calisthenics to go on could have proved to be far more serious. The administration's disciplinary action against the junior who was overseeing the calisthenics was an example of leadership as well.

An Example of Courageous Leadership by a Top Corporate Executive

In February 2020, Bob Iger announced that he was stepping down as the chief executive officer (CEO) of The Walt Disney Company. Disney is one of the world's top entertainment companies. The plan had been for Iger to stay on with the company until the end of 2021 as the executive chairman. There were rumors that he would be brought back as the CEO of the global empire in 2022. (Aten) However, in late 2021, Iger announced he was done at Disney and explained why. His reason is a powerful example of good leadership and honesty.

Iger said he had become more dismissive of other people's opinions than he should have. In other words, he did not listen to what other people were telling him anymore.

"Over time, I started listening less and maybe with a little less tolerance of other people's opinion," Iger said. "Maybe because of getting a little bit more overconfident in my own opinion, which is sometimes what happens when you get 'built up'." He was referring to the respect and praise he was getting for the job he was doing as the head of Disney.

What Iger was also saying was that sometimes success has a cost. For a leader the cost is that as you start to think that the success of any organization—whether it be a large corporation, a private company, a volunteer organization, a ship, or even just a division on a ship—is because of you. You become built up. When that happens, you think that your ideas are the only ones that count, and you don't listen to anyone else. That is not only arrogant, but also very dangerous for you and for your organization.

Iger's response and self-admission is worth noting because it's very uncommon for leaders, whether they be at the very top or in junior positions, to recognize that they were dismissing the input and value others bring to the organization. For a leader to admit that their leadership, or perhaps their leadership style, needs to change to help his or her organization move forward is bold and courageous.

In Iger's case, he was dismissing the concept of team play—listening to those around him who were being paid to present information, ideas, and problems. By not listening to his subordinates, he was discarding one of the basic principles of leadership. Give him credit, however, for recognizing this and stepping aside for someone else to take charge.

Reporting an Auto Accident in a Parking Garage

Steven Mintz, a retired professor and ethics lecturer, offers us an interesting situation—one that many of us have actually faced. You are in a parking garage in a very tight parking spot and as you pull out, you dent the car next to you. You're quite sure no one saw you. What do you do? (Mintz)

The ethical question is whether to inform the owner of the dent to their car and, if so, how do you do it?

How we deal with these dilemmas says a lot about our character and whether we act in our own interests or those of others. Some people would be tempted to leave and

avoid the hassle of reporting the incident. Your insurance rates will most likely increase and ignoring the matter may be the easiest solution. But is it the most ethical?

However, what if you think someone saw you? Does that change how you feel? If you leave the scene and do nothing, the person who saw you hit the car could report it to the police, and you may be charged with leaving the scene of an accident. Is that a risk you want to take?



A dent or scratched door is never any fun when you return to your car. Courtesy of iStock, Credit CasarsaGuru

In most states, says Mintz, you need to make a reasonable effort to identify the owner of the other car and notify them about what happened. If you are unable to find them, you should at least leave a written note with your contact information.

Now put the shoe on the other foot. What if someone dented *your* car as they were driving out of the parking spot? How would you feel?

Here's another scenario for you to consider. What if your child is in the car?

The child is old enough to be aware of your car denting the other vehicle. Would that change what you would do? Mintz says in this scenario, most people say they would at least leave a note for the other driver with contact information. This would send the right ethical message to your child that you are taking responsibility for your actions.

From a true ethical perspective, it shouldn't matter whether someone witnessed what you did or did not do. A person of integrity has their principles about what is right and wrong and accepts the consequences of their actions.

Mintz says a good way to check your behavior before acting is to ask how you would feel if your action was discussed on social media. Would you be proud to defend it?

Conclusion

There are many take-aways from the examples that we have provided here. The good examples involve solid communication, listening to those under your charge, taking care of your subordinates, and earning their trust. Leaders who fail at these qualities are most likely to see their organizations perform poorly. People are the engine that power any organization. Good leaders provide the fuel for those engines.

Critical Thinking

1. Look at Mr. Larry Fink’s 2022 letter to shareholders (See Bibliography). Fink is the chairman and CEO of BlackRock, an investment company that manages \$10 trillion in assets. In his letter, he tells CEOs of companies about the importance of building strong bonds with team members. How does this philosophy compare to Mr. Iger’s of Disney?
2. Christopher Michel offers compelling advice to leaders. Michel is the founder of the website *military.com*. He also founded a venture capital firm, Nautilus Ventures. In a podcast he says: “Once you’ve built a team that trusts you, and you trust them, anything is possible.” (Drumm) How important is it for you to have trust in your leader?
3. The studies that were done after the four collisions in the Pacific Fleet laid some of the problems at the feet of the Navy’s leadership in Washington. The reports said senior leadership was assigning too many commitments to its ships when the crews were not trained properly, and ship maintenance wasn’t being properly performed. How could this situation have been prevented?
4. What was your reaction to how the leaders at Boeing responded to what their subordinates were telling them?
5. Is there anything the subordinates at Boeing who saw their advice and opinions being ignored could have done to call attention to the problem?
6. What was your reaction to the Sailor who committed suicide? Do you think better leadership may have helped prevent it?

Study Guide Questions

1. After the failed drill on the USS *Santa Fe*, what changes did Commander L. David Marquet vow to make?
2. What is the definition of **autonomy**?
3. What evidence demonstrated that USS *Santa Fe* was no longer the worst ship?
4. What did the *Comprehensive Review of the Surface Navy* report find that leadership and commanding officers did that caused the collisions of four naval ships?
5. What are two outcomes the Readiness Reform Oversight Council (RROC) noted that the Navy changed based on the findings after the four naval ship collisions?
6. What did the division officer do right that made the Sailors in his division feel comfortable enough to tell him a crewmate was hiding a gun?
7. What basic principle of leadership did Disney’s former CEO, Bob Iger, disregard that caused him to leave the company?

New Vocabulary

autonomy
brig
Chief of Naval Operations (CNO)
combatant commanders
Commandant of the Marine Corps
court-martial
flag officer
geo-political situation
guided missile destroyers
helmsman
insidious
junior officer
lee helmsmen
manipulation
material readiness officer of the deck (OOD)
operational cycle
operational tempo
PCO
perishable skills
petty officer
public affairs officer
qualify
quarters
replenishment operations
resurgence
sectors
Secretary of the Navy
shareholder
stateroom
touch points
wardroom

Ethics as the Bedrock of Leadership

What You Will Learn to Do

This chapter will focus on ethics and why it's important for leaders to be honest and fair in all that they say and do. Being ethical also means respecting the dignity and diversity of all members of a team. To deviate from any of these principles will cause leaders to lose the respect of their subordinates. Once leaders lose the respect of those under their charge, the unit's morale and performance will suffer.

Skills and Knowledge You Will Gain

- ✓ Learn to listen to an inner voice that tells a leader what the right thing is to do.
- ✓ Understand the importance of following through on what you told subordinates you were going to do.
- ✓ Appreciate putting the needs of others (your team) over your own.
- ✓ Learn to make decisions consistent with the principles of honesty, fairness, decency, and integrity.
- ✓ Appreciate doing the right thing even when no one is looking.
- ✓ Appreciate doing the right thing when it is not easy or pleasant.
- ✓ Define the importance of leaders building “ethical muscle.”



Discussion about ethics at The Carnegie Council for Ethics in International Affairs. Courtesy of DVIDS, photo by Petty Officer 1st Class Daniel Hinton

Why Acting Ethical Is a Critical Component of Being an Effective Leader

Look around society today and you will find there are numerous examples on the part of both leaders and organizations who have chosen not to conduct themselves appropriately. Misbehavior of public figures have led to **cynicism** and an overall mistrust of public figures. Government officials accepting bribes, public figures involved in sexual assault or harassment, and celebrities or sports figures who lie publicly are just a few examples. These individuals are often those we have either elected to public office or have simply looked up to. But they have failed ethically and failing ethically as a leader equates to leadership failure.

New Vocabulary

cynicism—
an inclination to believe that people are motivated purely by self-interest; skepticism

What Is Ethical Leadership?

Ethical leadership is a person or leader acting in the right way to accomplish goals—much like Adm. Larson’s guiding principles that were discussed in chapter one. Those principles provide the foundation to influence others to do the right thing in the right way for the right reasons—all to help an organization become better and stronger while striving to accomplish overarching missions.

Bruce Weinstein, a management consultant who has written several books on leadership, asked 20 leaders from a variety of organizations what ethics means to them in one sentence. (Weinstein) Here are some of the responses:

- Ethics is the inner voice that drowns out rationalization and focuses us on what we know we should do.
- Doing the right, decent thing even when you have the power to do the convenient, self-serving thing.
- Ethics means making decisions in the context of relationships with others.
- That you operate from a set of values and principles from which you will not deviate; such values and principles include—but are not limited to—honesty, integrity, fairness, and honoring and respecting others.
- I have an interpretation of the Hawaiian word, “kīnaʻole”: Do the right thing, at the right time, with the right spirit to our customers and clients every time.
- Doing what you believe to be right and owning it—regardless of the outcome.
- Ethics means doing what is right even when no one else is looking, and holding yourself accountable to your colleagues, your organization, and most importantly, your principles.
- Ethics means doing the right thing when it is not easy, pleasant, or convenient.
- For me, ethics include the principles of honesty, integrity, fairness, and empathy.
- Ethics means consistently acting to deliver personal performance that instills trust, confidence, and credibility that then allows one to influence others in ways that promote the greater good of all.
- At the risk of simplification, to me, ethics means doing the right thing; listening to our internal alarm clock that goes off when we’re not doing what we know to be right.
- At the heart of ethics is a personal dedication to sincerely put the needs of others and the decency of the consequences of your actions before those of your own.

These one-sentence responses about what ethics means to a variety of leaders are extremely compelling. They go to the heart of any ethics discussion. In fact, each one could be used as a discussion item at an ethics seminar. They pertain to a leader in any organization—business, non-profit, government, volunteer, or military.



You quickly know if your organization is run by ethical leaders. Courtesy of iStock, Credit designer491

New Vocabulary

professor emeritus—
an honorary title for a retired professor who wants to stay active in scholarship following retirement

New Vocabulary

apartheid—
in South Africa, a policy or system of segregation or discrimination on grounds of race

What are the Integral Factors in Ethical Leadership?

Peter G. Northouse, a **professor emeritus** of communications at Western Michigan University, offers six factors he feels play integral roles in ethical leadership. (Northouse, p. 287) Each factor can be seen in the one sentence responses above that the business leaders gave us.

Northouse's factors are:

- Character of the leader.
- Actions of the leader.
- Goals of the leader.
- Honesty of the leader.
- Power of the leader.
- Values of the leader.

Character. Northouse provides an example of character in describing the late Nelson Mandela. When fighting to end **apartheid** in South Africa, Mandela was imprisoned. When given the chance to leave early in exchange for denouncing his views, he chose to remain in jail rather than compromise his position. Mandela showed his strong character by being good and honorable. He was also courageous and believed in fairness and justice.

The division officer who treats everyone in his division the same—regardless of their race, gender, or religious preference—demonstrates character.

Actions. Actions refer to the ways a leader goes about accomplishing goals. Are the means to accomplishing them moral? Do the ends justify the means or do the means justify the ends? The way a leader goes about their work determines whether they are ethical. What occurred at the Abu Ghraib prison in Iraq in 2004 is an example of the actions not justifying the means.

After the 9/11 attack on our country, national security and intelligence gathering became a priority. Rules and standards were expanded, and harsh methods were approved. Problems at the prison came to light when it was learned that prisoners

were being sexually abused and tortured. For example, images were released that revealed Soldiers urinating on prisoners' bodies, for example. Obtaining information this way was and is a violation of military regulations and rules established by the Geneva Convention.

The goal of supporting national security and intelligence gathering at Abu Ghraib was legitimate and worthwhile. However, the means did not justify the ends.

Goals. The goals of Cmdr. Marquet, the commanding officer of USS *Santa Fe*, was to improve the ship's morale and performance. He didn't necessarily intend to take it from being the worst in the fleet to the best. He wanted to improve it. The ship was a vital part of our defense posture. He saw a very capable crew but one that was not valued. They were not given the opportunity to use their skills, were not asked for their opinion on things, and were not challenged.

Marquet's goal was to change those things so that both the officers and crew could make *Santa Fe* a better ship. Both the officers and crew bought into Marquet's goals because they were goals the entire ship agreed upon.

Honesty. A key to ethical leadership is honesty. Clearly, followers demand that their leaders be honest. Dishonesty equates to lying and creates distrust. When followers see a leader as being dishonest, they come to see the leader as being untrustworthy and unreliable. They lose faith in them, and the leader's respect is compromised.

As a public affairs specialist in the Navy, and later a communications executive with both a **Fortune 50** company and the federal government, I worked daily with the news media. Unfortunately, I had the opportunity to witness some of my peers get into situations where they were not truthful in responding to questions from the press. When the truth about a given situation came out (as it always seems to do), my peers lost their standing with the media. Reporters found it very difficult to believe anything else my colleagues would provide them. They had dug themselves into a deep, professional hole. Sometimes getting out of that hole was virtually impossible. Once you have a reputation as being dishonest, it will often stay with you.

Dishonesty creates mistrust. It also casts a shadow over the leader. Subordinates talk among themselves. If a division officer tells a Sailor he is going to get him orders to a school and fails to follow through, that Sailor is going to tell his shipmates that the division officer failed to deliver. This will cast the officer as being unreliable or undependable. If, on the other hand, the division officer explains to the Sailor that he tried to get him a school but there is currently a lack of training funds or the school has no openings right now, we have a different situation. The division officer can be seen as attempting to follow through.

Power. Northouse says power is the capacity to influence or affect others. How a leader uses power says a lot about a leader's ethics because it can be abused.

Let's use another Navy example. A division officer tells some Sailors in his division that he is having some problems with his home computer. One of his men offers to come over to his home and try to fix the problem. The officer tells the Sailor that if he does, he will tell the LPO to keep him off the **Watch Bill** for a month. Clearly, this is abuse of power and is unethical.

On the other hand, power can be used to help others. Let's use the earlier example of the Sailor who was unable to attend a school for some training because the ship lacked funds for either the training itself or the travel costs. The division officer, because he really wants to help the Sailor succeed, chooses to go to the executive officer to make a strong case on the Sailor's behalf. The Sailor is a hard worker and deserves to attend the school. The division officer is successful in making the case. This is an example of power being used positively.

New Vocabulary

Fortune 50—
a ranking of the global companies that show the best prospects for sustained, long-term growth

New Vocabulary

Watch Bill—
shows the assignments of Sailors for a division, regardless of whether underway or in port

Values. Northouse characterizes values as the ideas, beliefs, and modes of action that people find worthwhile. An ethical leader has strong values and promotes positive ones within their organization.

A division officer often talks about his wife and family, and then is observed by some of his Sailors at a restaurant having an intimate dinner with a female officer from the ship. The Sailors return to the ship the next day and tell their shipmates about what they saw. Both officers have lost credibility and trust with those they lead. They are looked upon as having poor values.

Another division officer and his wife choose to participate in a Big Brothers/Big Sisters mentoring program in the community. The officer frequently brings his wife and a young teenager they are mentoring aboard the ship when they are in port and when he has duty. The young female teenager is intrigued and impressed with the ship and the men and women she meets during her visit. The men and women in the officer's division are similarly impressed with the efforts the officer and his wife have undertaken to mentor the teenager from the community. The officer is seen as having strong values and as being good role model.



Core Values are important in all branches of the military. Courtesy of DVIDS, Photo by Chief Warrant Officer Donnie Brzuska

Building the "Ethical Muscle" to Do the Right Thing

Developing ethical muscle is comparable to going to a gym and working out to maintain one's physical fitness and muscle. You cannot attain physical fitness and strong muscles by working out only periodically. Just as it takes commitment to go to the gym on a regular basis to maintain one's fitness, it takes a similar commitment to build ethical muscle. It must occur on a regular basis if we are to possess the insight the twenty business leaders provided to Weinstein and the six factors that Northouse offers us. It requires work and practice.

What leaders must first do is conduct a self-assessment of their various qualities and ask themselves what factors they feel they need to work on.

For example:

- Are you are biased in any way?
- Do you treat everyone in your charge equally and fairly?
- Do you live by the golden rule and treat others as you would like to be treated?
- Do you conduct yourself as you expect others to conduct themselves?
- Are you always honest? Do you avoid half-truths?
- When you provide your evaluations to your subordinates, are you totally honest with them? Do you have the courage to tell them some of their weaknesses and what they need to improve on?
- Do you abuse the power that you have? Do you take advantage of those under your charge?
- When you went to the supermarket, were you as respectful of the cashier as you were to your boss or the commanding officer of your ship?

At the end of the day, it is helpful to review the factors that you felt need work and assess how you did in improving them. As you look back on your day and the various actions you took, sometimes it comes down to being able to look at yourself in the mirror and ask, “Did I do the right thing with situation X?” or “Was I totally honest with Sailor Y when I gave him his evaluation?”

Doing the right thing is not always easy. However, it’s what forms the basis of integrity and ethics and therefore, leadership. Doing the right thing is being honest; never compromising yourself; telling the whole truth in any situation, even when it’s very hard; and doing all these things when you are alone, and no one is around to see it.

To do the right thing requires continuous work to build and maintain the ethical muscle needed to be a solid leader. Leaders will find that the more they practice doing the right thing, the easier it becomes.



Where are you on your path to being a better leader? Courtesy of iStock, Credit airdone

The Ethical Imperative for All Military Leaders

All the leadership principles we have discussed in this and previous chapters are pertinent to leaders who work in any sector, be it corporate, private, non-profit, government, volunteer, or military.

Vice Adm. James B. Stockdale, a former prisoner of war and Medal of Honor awardee who spent more than seven years in a Vietnamese prison, contends that personal integrity is the core value expected of a military officer (Montor).



Vice Admiral James B. Stockdale upon receiving the Medal of Honor from President Gerald Ford for actions during the Vietnam War where he was the leader of U.S. prisoners of war. Courtesy of DVIDS, Photo by Katie Lange

Stockdale says if personal integrity does not come naturally to the military officer, then he should choose another line of work. Stockdale says that the people an officer is responsible for are our most precious assets, and how they are treated must be above board. We insist that these people deserve trustworthy leaders of integrity.

Stockdale differentiates the civilian workplace from the military workplace by noting the military is the profession of arms—the profession of warfighting—where friendships are overridden by the more powerful force of comradeship.

Stockdale cites the philosopher Jesse Glen Gray who spent all of World War II as a ground Soldier in Europe. Gray noted how men in battle would lay down their lives for unit companions they were known to not even like. Gray says people of integrity under a common danger **coalesce** into a unity that surpasses friendship.

“Loyalty to the group is the essence of fighting morale. Friendship is not just a more intense form of comradeship but its very opposite: While comradeship wants to break down the walls of self, friendship seeks to expand those walls and keep them intact.”

~Jesse Glen Gray

So, Stockdale says that where an ethics program may seem unnecessary or foreign to some (businessmen, for example), those in the military who are engaged in the profession of arms are comfortable with it. “Our major product,” says Stockdale, “is comradeship in the heart of battle. And in our business, how we lavish our skills of leadership on comrades is bottom line stuff.”

The Navy has honored Stockdale in several ways, including a guided missile destroyer being named after him. A statue of him was erected in front of Luce Hall at the Naval Academy—the building that houses the Vice Admiral James B. Stockdale Center for Ethical Leadership. An annual Navy award for inspirational leadership also honors Stockdale.

New Vocabulary

coalesce—
come together to form
one mass or whole



If personal integrity does not come naturally to the military officer, then they should choose another line of work. Courtesy of DVIDS, Photo by PO3 Wesley J. Breedlove

Being Responsible for One's Actions 24 Hours/Day

New Vocabulary

litmus test—
a test in which a question reveals the true measure of one's ethics, morals, honesty, and/or honor

Earning a military commission carries with it an obligation to act ethically at all times, not just when in uniform. An officer is responsible and accountable for their actions 24 hours a day in both their official and personal lives. Karel Montor, a professor of leadership at the Naval Academy, says that is what accepting a commission means.

Montor provides a good **litmus test** for officers. He says if an officer is prepared to talk about their actions—or lack thereof—in front of a national audience, made up of all their seniors, peers, subordinates, and friends who share the same professional values, and whose opinions they value, then their behavior was/is probably ethical.

Montor also provides this short item about what happens to an officer who deviates from expected leadership principles and how it leads to losing their integrity.

First you find yourself overlooking small infractions that you would have corrected on the spot in the past.

Soon, you are a participant in these infractions. "After all," you say, "Everybody's doing it."

All too soon, you find yourself trapped: You no longer can stand on a favorite principle because you have strayed from it.

Finding no way out, you begin to rationalize, and then you are hooked.

The important fact is, the officers who travel the path outlined above have misused the very basic quality and characteristic expected of a professional officer, or any other professional for that matter.

They have compromised their integrity.

~Karel Montor

We will look at some specific examples of both good and poor ethical behavior in the next chapter.



Doing the right thing is not always easy. Courtesy of iStock, Credit marekuliasz

Conclusion

People are an organization's most important asset. For that organization or unit to function, it must have good leadership. Good leadership equates to leaders who are seen as being ethical. They are ethical because they do what they say they are going to do; tell the people what they need to hear (regardless of whether it is good or bad news); are seen as taking actions that benefit the organization and its people rather than themselves; are seen as being fair and respectful to every member of the team; and are seen as being consistent in what they say and do. A leader who talks about the importance of gender equality and then is heard telling an off-color joke is not being consistent. The leader's honesty, trust, and integrity are now in doubt. Confidence has been lost, and the ability of the leader to motivate and inspire has been diminished.

Critical Thinking

New Vocabulary

apartheid
coalesce
cynicism
Fortune 50
litmus test
professor emeritus
Watch Bill

1. Here are some quotes from notable executives on leadership, integrity, and ethics. Which one or ones have the most meaning to you? Why? (Alger)
 - (A) “A true leader does not set out to be a leader but becomes one by the quality of his actions and the integrity of his intent.” William E. Greehey, former CEO of Valero Energy Corporation
 - (B) “Treasure your integrity—you can only lose it once.” James A. Patterson, Owner/President, Pattco, LLC
 - (C) “There is nothing more important in your business or personal life than integrity.” Sam Fox, Founder, Chairman and CEO, Harbour Group
 - (D) “You already know the difference between right and wrong. Doing what is right defines character and should set the path for your future.” Raymond G. Chambers, Chairman, Amelior Foundation
2. Conduct a self-assessment of your various qualities using the questions in the *Building the “Ethical Muscle” to Do the Right Thing* section above. What factors do you feel you need to work on?
3. Provide an example of how the power of a leader could be used to benefit a unit or a member of the unit. Provide an example of how such power can be abused?
4. The golden rule is a moral principle that says, “Do unto others as you would have them do unto you.” How does this principle relate to leadership and ethical behavior?

Study Guide Questions

1. What is ethical leadership?
2. What are the six factors that Northouse feels play integral roles in ethical leadership?
3. What are the qualities that define the character of a person?
4. What’s the importance of honesty?
5. According to Stockdale, what is the core value expected of a military officer?
6. What happens to an officer who deviates from expected leadership principles?

Case Studies in Ethics

What You Will Learn to Do

This chapter will provide you with some real-world examples of ethical issues and actual case studies that have been documented. Some of the cases were handled correctly and appropriately. Others showed severe lapses in ethical judgment and a lack of ethical muscle that we discussed in the last chapter.

We can learn from both and hopefully strengthen our ability to do what is right when we are faced with difficult ethical dilemmas.

Skills and Knowledge You Will Gain Along the Way

- ✓ Understand how developing a moral compass allows leaders to do what is right.
- ✓ Appreciate how following rules allowed leaders to do the right thing.
- ✓ Consider that even in war, leaders need to use good judgment and must rely on their instincts to differentiate between right and wrong.
- ✓ Learn how lying and cheating to make a unit look good is a moral and ethical failure.
- ✓ Learn that harassment and bullying do not represent ethical behavior and must not be tolerated.
- ✓ Appreciate that doing the right thing sometimes takes courage.



Developing one's moral compass is an important step in becoming a good leader. Courtesy of iStock, Credit MicroStockHub

Introduction

Leaders have responsibilities, and one of those responsibilities is to be accountable for their actions. This accountability can never be delegated to anyone in your organization. This is the primary reason for a leader to act ethically. If a leader is seen as taking short cuts, abusing his power, not being fair to everyone they are responsible for, not telling the truth, or simply being a poor role model, their reputation is tarnished, and they have lost respect. They have also lost the trust of subordinates and are now perceived as being unethical. Their ability to lead has been greatly diminished, if not lost forever.

What we'll do in this chapter is look at some actual cases where some leaders took the right ethical action while others did not. We will show the consequences or outcomes in each case. These cases are documented in two outstanding books—*Ethics for the Junior Officer: Selected Cases from Current Military Experience* and *Case Studies in Ethics for Military Leaders*. These books contain several other case studies that you may find of interest and which you can learn from.

Rescuing Boat People at Sea

New Vocabulary

amphibious ship—
a naval ship which is designed for long sea voyages and for rapid unloading over and on to a beach

junk—
a Chinese boat

motor whale boat—
small open hulled double-ended boats used by the Navy and Coast Guard

emaciated—
abnormally thin or weak

As a Navy **amphibious ship** was transiting the South China Sea near Singapore, the bridge crew came across a fishing **junk** with a lot of people waving frantically. The bridge crew even believed they saw one of the people on the junk jump into the water. The Officer of the Deck (OOD) reported what he had seen to the captain, who was in his cabin at the time. The captain came to the bridge to see for himself. (Rubel 2014, p. 13)

The Navy ship was enroute to Bahrain to conduct an important minesweeping operation in the Persian Gulf. The ship was behind its planned schedule.

As the ship got closer to the junk, the waving became more frantic. The captain noticed that those in the junk looked Vietnamese, so he asked that one of the crewmembers who was Vietnamese to get in a **motor whale boat** with some other crewmembers and get a closer look at the junk.

The motor whale boat crew reported that the junk had a makeshift sail and an engine that was dead. The crew reported that there were about 60 men, women, and children onboard. They looked **emaciated** and desperate. The Navy Sailor, who was Vietnamese, was able to ask questions of those in the junk and learned they had left Vietnam seven days ago and were enroute to the Philippines. Twenty individuals had already died.

New Vocabulary

standing orders—
a written discourse that illustrates the commanding officer's views on how he or she wants the ship to operate

One of the officers on the ship reminded the captain what the **standing orders** were in these situations:

- A commanding officer must render assistance to any person found at sea in danger of being lost.
- When encountering people in danger at sea, where relief of persons in life endangering situations cannot be accomplished by repair to boats or navigational assistance, rescue is normally by *embarkation* (taking the individuals in danger aboard the ship).
- If refugees are experiencing or apt to experience hardship (unseaworthy vessel, adverse weather) that could lead to death, refugees could be taken aboard.



Vietnamese boat people adrift in pursuit of freedom. Courtesy of the Department of Defense, Photo by Phill Eggman

The captain made the decision simply to provide the refugees provisions, thinking they would be fine and would be able to somehow find their way to the Philippines using the sail they had made. He provided them 300 pounds of fresh fruit, 100 pounds of canned food, uncooked rice, 50 gallons of water and some navigational charts. He felt if he picked up the refugees, he would put the ship further behind schedule, place his crew in danger of unknown diseases, and perhaps danger from the refugees themselves.

His decision was the wrong one—and certainly not an ethical one.

The food provided to the refugees lasted only a few days. Their boat drifted in the currents for 19 additional days, and 30 more refugees died. As the people died, their bodies were eaten by others in order to survive.

When the situation was learned and reviewed by higher authority, his superiors felt the captain's actions should be referred to a Captain's Mast (or non-judicial punishment). Instead, the captain asked for a court-martial (which was his right). The court-martial found him guilty of **dereliction of duty** for failing to give adequate aid. He was also given a letter of reprimand detailing his wrongful actions.

Taking the refugees aboard his ship and making an unplanned transit to the Philippines or another location where the refugees could be placed ashore would have been the correct, and humane, decision. The commanding officer in this case lost his moral compass.

"The United States Navy is investigating allegations that the crew of a Navy ship refused to rescue some Vietnamese boat people who later resorted to murder and cannibalism to survive at sea, officials said today." New York Times August 11, 1988, Section A, Page 7

Newspaper article reporting on the investigation of the incident. Courtesy of New York Times

New Vocabulary

dereliction of duty—
deliberate or accidental failure to do what you should do as part of your job

Mỹ Lai and Hugh Thompson

The Mỹ Lai massacre was one of the most horrific incidents of violence committed against unarmed civilians during the Vietnam War. The massacre and coverup that followed is well documented. A good summary of what occurred can be found on the History.com website (History).

In March 1968, a company of U.S. Soldiers brutally killed most of the people in the village of Mỹ Lai. More than 500 were slaughtered. This included women and young girls who were raped and mutilated before being killed. The incident was covered up for a year before it was reported in the U.S. media. It led to a firestorm of international outrage. How the Vietnam War was being handled by both American political and military leadership was not getting good marks. Mỹ Lai further divided the country.

The North Vietnamese had launched a major offensive in January 1968. Morale on the ground was very poor and the enemy offensive worsened it. One Army company, called Charlie Company, had lost a sizable number of men and was down to 100 Soldiers. Charlie Company, under the leadership of Captain William Calley, were ordered to an area called Son My. Charlie Company was told that anyone found in the area should be considered enemy Viet Cong (VC) or VC sympathizers. The U.S. Soldiers were told to destroy the village.

When Charlie Company arrived, they could not find any VC. Instead, they came across a quiet village of primarily women, children, and older men preparing breakfast rice. Only a few weapons were found, but Captain Calley ordered his men to begin shooting the villagers. Some Soldiers balked at the orders, but the massacre had begun. In addition to unarmed men, women, and children, the Soldiers slaughtered countless livestock, raped an unknown number of women, and then burned the village to the ground.

The massacre reportedly ended only after Chief Warrant Officer Hugh Thompson, an Army helicopter pilot on a reconnaissance mission, landed his aircraft between the Soldiers and the retreating villagers. Thompson threatened to open fire on the Soldiers if they continued their attacks.

Thompson later said that as he was flying, he and his crew started to notice the large number of bodies everywhere on the ground. “Everywhere we’d look, we’d see bodies. There were infants, two-, three-, four-, five-year olds, women, very old men, no draft-age men.” Thompson and his crew flew dozens of survivors to receive medical care.

When the massacre ended, 504 people had died. This included 182 women—17 of whom were pregnant—and 173 children—56 of whom were infants.



The Mý Lai massacre was the mass murder of over 500 unarmed Vietnamese citizens, including women and children, by U.S. troops in Sơn Tịnh District, South Vietnam, on March 16, 1968. Courtesy of iStock, Credit RenHo

What made the tragedy even worse was a coverup of the massacre. Knowing that if news of the massacre were to get out, it would be very bad for Charlie Company. So, officers who were higher up in Charlie Company's chain of command made efforts to downplay the slaughter. This was a total failure of that unit's chain of command.

A Soldier, Ron Ridenhour, who had heard reports of what had happened at Mý Lai began a campaign to bring the events to light. He wrote letters to numerous cabinet officers and members of Congress. Ridenhour even wrote to then President Richard Nixon. He never received a response. Ridenhour finally decided to give an interview to a reporter from *The New York Times* who broke the story in 1969.

The events at Mý Lai, along with the coverup, caused international anger and more protests in the U.S. A major investigation was undertaken that led to 28 officers being charged for their involvement. That number was later reduced to 14. All were **acquitted**, except for Captain Calley, who was found guilty of premeditated murder. He was given a life sentence. His sentence was appealed and ultimately reduced to 10 years. He was paroled in 1974.

In 1998, 30 years later, Thompson and two of his crewmembers who were flying the helicopter and stopped what was happening at Mý Lai, received the Soldier's Medal. The Soldier's Medal is the Army's highest award for bravery not involving direct contact with the enemy.

The events surrounding the Mý Lai massacre reflected a total ethical failure on the part of many Soldiers. In fact, it was an abysmal failure that reflected poorly on our entire nation. Morale in the entire military had plummeted during the Vietnam War, and Mý Lai caused it to plummet even more. It was made even worse when many officers in the chain of command actively concealed the events.

The courageous actions of Hugh Thompson and his crew and Ron Ridenhour were perhaps the few redeeming things to come out of the event. Sadly, however, Thompson said during a media interview that he was **ostracized** and received death threats after returning from Vietnam for his actions. In 1998, the year he received his award from the Army, Thompson attended a memorial service at Mý Lai on the 30th anniversary of the massacre.

New Vocabulary

acquitted—
free (someone) from a criminal charge by a verdict of not guilty

New Vocabulary

ostracized—
excluding (someone) from a society or group

Video Harassment

A lieutenant is on board a destroyer deployed to the Sixth Fleet in the Mediterranean. He's been aboard for over two years and is getting ready to receive orders to a new command. (Montor, p. A-107)

He learns that a division aboard the ship has produced a video that makes fun of the only black person in the division. The lieutenant has seen the video and found it distasteful and clearly does not meet the standards the Navy has set for equality.

The lieutenant presents the issue to the executive officer who dismissed it as a matter that does not deserve disciplinary action.

Has the lieutenant fulfilled his responsibilities by going to the executive officer? Should he go to the commanding officer?

The lieutenant decided to submit a formal grievance through the chain of command. The video was destroyed, the individuals in the division were censured, and the executive officer was given a letter of reprimand.

Montor correctly states that if we—as U.S. military officers and leaders—do not embrace the responsibilities of putting an end to discrimination in our service, decreased morale and animosity between the races will continue. High morale and mission accomplishment can only be achieved in an environment of equality and fairness.

The video in this case could also be interpreted as *bullying* the black person in the division. Bullying is abusing, humiliating, or mistreating an individual or group of individuals who are vulnerable. The results of bullying can be physical, but the results can also be emotional.

You must do the right thing, even if it brings you under fire from those senior to you in the chain of command. As Montor contends, “Each of us is prepared to die for our country; let’s make sure we are also prepared to live for it, even if it means sacrificing our career in pursuit of encouraging growth within our military.” (Montor, p. B-43)

Cheating on High School Standardized Test Scores

Damany Lewis was a math teacher at Parks Middle School in Atlanta in 2006. Parks was in a very poor neighborhood plagued by violence. Lewis was determined to help his students succeed and was labeled as a “star teacher” and a “very hard worker, who will go the extra mile” by his colleagues. (Cheating: Atlanta’s School Scandal)

Teacher evaluations in Atlanta were linked to students’ performance on standardized test scores. Schools whose students did not make appropriate progress toward the standardized test goals received warnings that ended up with faculty and staff being replaced or even the school being closed.

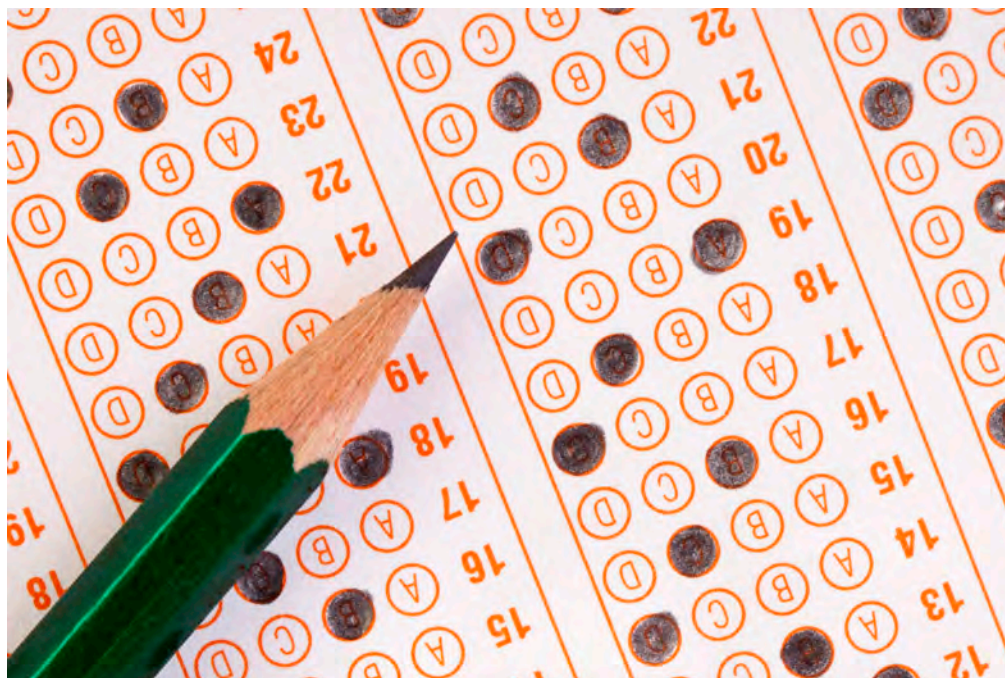
Parks had been classified as a school in need of improvement for the past five years. Unless 58 percent of students passed the math portion of the standardized test and 67 percent passed the language arts portion, the school would be closed. Its students would be separated and bussed across Atlanta to different schools.

Lewis said his sole obligation was to never let that happen. He pushed his students harder than they had ever worked before to prepare for the math test. Lewis knew this was going to be a challenging task—an uphill battle to say the least.

Lewis's principal was new to the school and had heard that teachers at some other schools had changed answers to standardized tests. Teachers would supposedly say they were looking for stray pencil marks.

The new principal asked Lewis and some other teachers to do the same. So, Lewis found the exams of students who needed to get a few more questions right in order to pass and changed their answers. Lewis had convinced himself that if he did not change his students' scores, they would go into a "why try" attitude.

When the results came out, the school did better than ever on the standardized tests. The faculty was joyous. They felt the school and students had reached a level of success.



A standardized testing answer sheet. Courtest of iStock, Credit gecee33

The same process of changing answers continued for four more years. By this time, nine additional teachers were helping Lewis. However, in 2010, 50 agents from the Georgia Bureau of Investigation visited Parks Middle School and several others. The investigators concluded that teachers and administrators at 44 schools had cheated in the same way Lewis had.

In 2012, 110 teachers who had confessed or been accused of cheating were placed on administrative leave. Lewis was among them and was ultimately fired.

Unfortunately, what Lewis was trying to do when he set out to improve the test scores was to get his students out of the same type of environment and neighborhood he grew up in. He felt that by increasing their scores, it would provide a way out of the violence, poverty, and poor living conditions that existed in that part of Atlanta. It was a flawed decision.

How a Strong Ethics Program Discovered a Murderer at the Naval Academy

When Adm. Larson returned as the superintendent at the Naval Academy in 1994, he saw that the school had taken a different direction since he was there as

superintendent in the 1980s. He felt the school had become too much like a civilian college. It had lost its focus on developing leaders with character.

So, one of the first things he did when he returned was to put a character development program in place that stressed leadership and ethics.

The program began to take shape and catch on with the faculty, staff, and most importantly, the midshipmen. The proof of that came in the summer of 1996.



Swearing in of the class of 2020 Midshipmen. Courtesy of DVIDS, Photo by Stacy Godfrey

Plebes (or freshmen) have very little time during their initial summer training. What little time they do have comes during the evening hours before taps (in bed with lights out). During these short periods in the evening, the midshipmen would get to know each other a bit more and further their bonding.

During one of these bonding sessions, one of the female plebes, Diane Zamora, kept asking her fellow female classmates about the worst thing they had ever done in their lives. It was her version of truth or dare. Her classmates would answer with relatively simple examples—drinking when they were underage, sneaking out of the house late at night to be with their boyfriend, and so forth.

When her classmates would turn the question around and ask Zamora, she would tell them that she had committed murder when she was in high school in Texas. Her classmates were in disbelief and thought her comments were just bluster. How could anyone admitted to the U.S. Naval Academy have ever committed murder?

The discussions continued for several evenings, and Zamora's comments always came back to her committing murder in high school. Finally, the classmates had heard enough and felt it was time to inform their chain of command what they were hearing from her. Her classmates were convinced there might be something to her flamboyant talk.

After the plebes reported Zamora's comments to their midshipmen leadership, the upperclassmen, in turn, reported the comments to the active-duty staff members in their chain of command. To ensure Zamora's claims were thoroughly investigated, one of the Academy's lawyers started calling various jurisdictions in Texas to inquire about any unsolved murder cases. After numerous calls, they hit pay dirt.

One of the jurisdictions in Grand Prairie acknowledged they did have an unsolved case on their books. When they were told what had been learned at the Naval Academy, two detectives quickly came to Annapolis.

After questioning Zamora, they were convinced she had committed the murder. They also believed that her boyfriend, David Graham, who was a freshman cadet at the Air Force Academy played a role in the murder.

The two were arrested, tried, and convicted of murder. The murder resulted from a lover's triangle. Zamora believed that a high school classmate, Adrienne Jones, was a romantic rival for her boyfriend. So, Zamora's boyfriend went to Jones's home and picked her up to go for a ride in Zamora's car. Zamora was hiding in the trunk. They drove to a remote location where a struggle ensued. Zamora hit Jones over the head, and Graham shot the girl after she had broken away from Zamora.

There was never a doubt in the minds of any of us who were on Adm. Larson's staff that the character development and ethics program that Larson had put in place was the **impetus** that made Zamora's classmates feel compelled to report their conversations to their leadership. They were very courageous in making their case. Furthermore, the Academy's leadership and midshipmen chain of command demonstrated they trusted the judgment of the classmates.

New Vocabulary

impetus—
the force that makes something happen or happen more quickly

How a Leader Needs to Handle a Superior Who Isn't Following Guidance

You are a newly qualified ensign standing your first officer of the deck (OOD) watch on the **quarterdeck** of your ship. Only a few days earlier, the executive officer put out the word that all hands leaving the ship must be in the proper uniform or civilian attire. (Montor, p. A-161)

You send back several junior crew members who try to leave the ship with improper haircuts and shaves. Several hours later, after all the junior personnel who were going ashore had departed, a highly respected chief petty officer approaches the quarter deck in need of a haircut.

What should you do?

Several crew members are working near the quarterdeck, and all eyes are on you. You know the chief and know that he could have left the ship earlier. However, he was still onboard because he was helping some new people who had just reported aboard. Helping others was one of his known strengths. He was a very strong chief petty officer.

You consider talking to the chief about his appearance, but you let him off the ship. You feel you can talk to him later when he returns and that he will meet the expected standards in the future.

The chief does, in fact, have status as a senior petty officer. However, because he has that status, he should know better. If the junior officer OOD refused letting him off the ship, the chief hopefully would have understood and accepted the order. The OOD is the direct representative of the commanding officer and will ensure that all orders are obeyed and enforced.



Sailors receive haircuts to meet Navy standards. Courtesy of DVIDS, Photo by Michael A. Prusiecki

New Vocabulary

quarterdeck—
the quarterdeck is the ceremonial center of the ship in port, and is also the entrance point for everyone coming aboard

The OOD did not do the right thing and therefore, sent a poor message to those crewmembers who were working near the quarterdeck. That message was there is a double standard on the ship—one for junior enlisted crewmembers and another for senior crewmembers.

Rank does have its privileges, but not in this case.

Story Telling... and When it's Time to Stop

A maintenance division of 18 men and two women have a superb reputation for outstanding, flawless work. Five of the men have reputations as “lady killers.” They always share their exploits from the previous evening with everyone in the shop while on break. (Montor, p. A-156)

The women don't ask the men to stop telling the stories, but officer notices they roll their eyes and seem disgusted with the tales. The officer responsible is pleased with what the division accomplishes—along with its reputation that reflects on them as the division officer. However, the officer is concerned with the impact the stories are having on the women.

What should the division officer do?



Sailors on leave out for a night of fun, however, don't always share your exploits. Courtesy of iStock, Credit ablokhin

The officer could easily turn his back on the situation and rationalize that “If it ain't broke, don't fix it.” However, this is not the correct response.

It's important for the officer to speak to the division and offer his perspective of what he has observed. He should introduce his comments with praise for the outstanding work that the division does. The work they do allows the ship to perform safely and efficiently.

However, the story telling needs to stop. There is no room in today's military for sexual degradation. It is no more proper to tell jokes that are offensive, than to tell racial or religious jokes, or to malign any portion of society. The **social mores** of the military

New Vocabulary

social mores –
the customs, norms, and behaviors that are acceptable to a society or social group

are changing for the better, and it is important for everyone to support the new policies that will allow for harmonious relationships among all personnel.

When something is wrong, the time to stop it is when a leader first hears about it or sees it. Not to act means you become part of the problem rather than part of the solution.

Critical Thinking

1. Lew Brock, a Hall of Fame baseball player, says, “Most people have an inner person that holds the keys to their social, leadership, and relationship performances.” Other individuals refer to an inner alarm clock when it comes to discussing ethics and integrity. What do you think they are referring to?
2. In the Mai Lai massacre case, what are some of the ethical lapses that took place? What was your reaction to the resulting charges against Captain Calley?
3. How could the teachers and school administrators in Atlanta have better handled the standardized tests issue? What other options did they have? What would have been a better way to tackle the issue?

Study Guide Questions

1. In the case of the ship’s captain and the Vietnamese refugee boat, name two things the captain could have done to help the refugees, but failed to do?
2. According to Montor, if the U.S. military officers and leaders embrace the responsibilities of putting an end to discrimination in our service, what might happen?
3. What does OOD stand for and what do they do?
4. What does it mean to be ostracized?
5. What is meant by dereliction of duty?

New Vocabulary

acquitted
amphibious ship
Bachelor Office Quarters (BOQ)
dereliction of duty
emaciated
impetus
inculcated
junk
motor whale boat
ostracized
quarterdeck
social mores
standing orders

Unit 4

Cyber Technology

Cyberspace is everywhere. We access it through our phones, tablets, TVs, and computers. Through Cyberspace, we can shop, watch, and play games. The internet has revolutionized society, creating new opportunities for learning, working, and fun. At the same time, the internet has a dark side. Criminals, intelligence services, and cyber commands take advantage of a free and open internet. Criminals rob banks in cyberspace through fraud and criminal gangs extort companies for ransoms through malware. Intelligence services recruit spies in cyberspace, steal secrets, and conduct information operations. Cyber commands map critical infrastructure networks to lay the groundwork for future attacks. After each major cyber incident, corporations and the U.S. government create new ways to protect cyberspace. The government employs over three million people and spends over four trillion dollars a year on cybersecurity to protect the U.S. from nuclear attack, ensure the high seas are free for maritime trade, and promote a free, open, and safe cyberspace. In this unit, you will learn about the nature of cyberspace, the threats that exist in cyberspace, what the U.S. does to prevent these threats, and the careers that you can pursue in this field to help defend our nation.

Nature of Cyberspace

What You Will Learn to Do

It is simply hard to imagine what life was like before the information age. There were no library databases for research sources and a "googol" was just a very large number. There was no such thing as ordering online and the Amazon was just a river. There were no touchscreens, and a mouse was just a small mammal.

Much has changed since a simple internet went live in 1969 and the first email was sent in 1971. Over 90 percent of Americans now have access to the internet! The applications are boundless. There are the fun ones, like an app to play games or connect with firends. There are also the serious ones that let the Navy patrol the waters of the Middle East with an uncrewed vessel. Technology continues to evolve. As the physical and virtual worlds converge, it is more important to understand technology and cyberspace.

Skills and Knowledge You Will Gain Along the Way

- ✓ Explain the origins of the internet.
- ✓ Understand how networks operate and data move across networks.
- ✓ Appreciate how networks are largely private but have become a public space.
- ✓ Consider the implications for personal security in the cyber age.
- ✓ Appreciate the impact of cyber insecurity for national security.

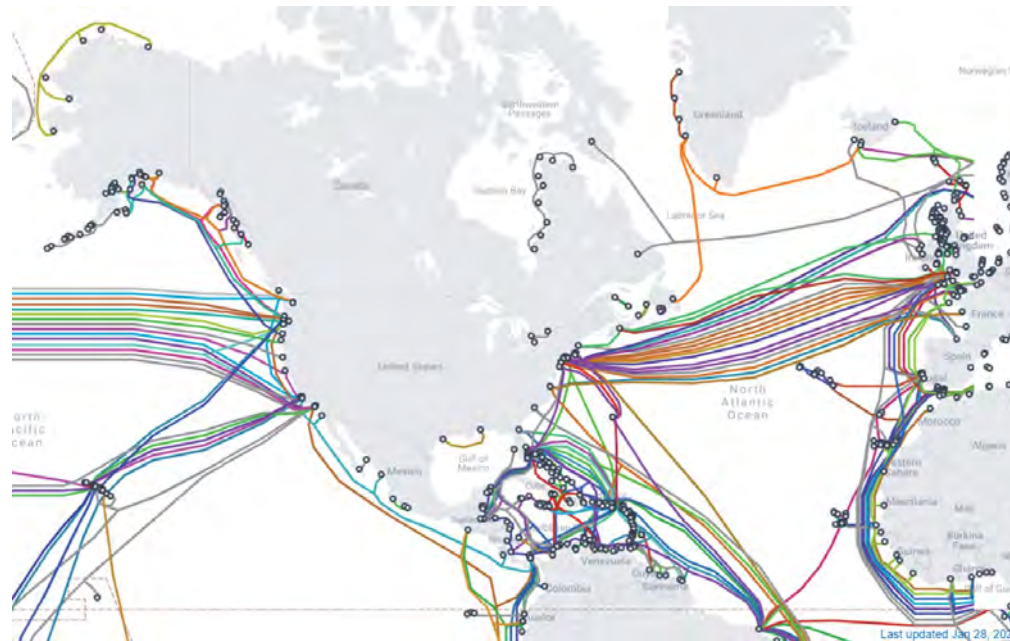


Unmanned Surface Vessel. Courtesy DVIDS, Photo by Cpl. DeAndre Dawkins

Private Networks, but Public Space

The U.S. government was an important actor that created the **internet**. However, individuals and companies now play more important roles than government in cyberspace. Telecommunications companies own the fiber optic cables that carry data. Internet service providers route internet traffic, host websites, and maintain the network infrastructure. Private companies make computers, phones, and other hardware that connect people to **cyberspace**. The **cloud** providers offer data storage for individuals, schools, companies, and governments.

Cyberspace is also global. Submarine cables provide the primary means to connect networks in the continental U.S. with the rest of the world. The cables are generally owned by private companies. Within the U.S. government, the Federal Communications Commission (FCC) grants licenses to companies to create cable landing stations in the U.S. As space-based internet connects more people around the world, the FCC also regulates satellite communication to the ground.



Submarine cables connect the continental United States to the world. Courtesy of TeleGeography

New Vocabulary

internet—
an electronic communications network that connects computer networks around the world

cyberspace—
the network of interconnected computers that span the globe and the information that traverses and is stored in it

cloud—
data storage off-site from where the users are and accessed through the internet

Implications for Personal Cybersecurity

New Vocabulary

cybersecurity—
the protection of data on
computers from
unauthorized access,
theft, or attack

The information age has certainly provided individuals with important tools. This ranges from following your favorite influencer to making your own videos or podcasts. There is simply no exaggerating how important cyberspace is to daily life. We get glimpses of this when storms turn off electricity or internet access. In addition to natural disasters that disrupt internet usage, criminals and foreign governments cause problems too. The next chapter explores these threats in cyberspace, but as you read this book, always think about the implications for your personal **cybersecurity**.

While you probably don't have to worry about Russian foreign intelligence monitoring your video game, there are important things for you, your family, and school to do to improve cybersecurity. As the Cybersecurity and Infrastructure Security Agency (CISA likes to remind all Americans—Stop.Think.Connect. There are simple steps we can all take to be safer online:

- **There is no delete button on the internet.** Don't share or post things that are too private for the world to have, forever. Use the privacy settings to limit what you share.
- **Connect only with people you trust.** Bullies, scammers, and predators are online too. Save private things for people you know.
- **Report suspicious or harassing behavior.** Parents and teachers can help when being online is no longer fun.
- **Use strong passwords and protect them.** If you wouldn't give someone your front door key, don't share your passwords. Passwords should be long and strong. Every account should have a different password, so consider a password manager. Another way to create long passwords is to use a song lyric, movie title, or catchphrase. Substitute the number 1 for the letter l.
- **Phishing is a common tactic that undermines personal cybersecurity.** This is when criminals send a text or email that tries to steal your personal information or take-over your devices.
- **Don't reply to a text or email that asks for personal information.** It may seem harmless, but sharing your mother's maiden name, favorite pet's name, or birth date can give someone enough information to steal more of your privacy.
- **Don't click on the "too good to be true" links.** If someone is offering a free iPad, delete the text or email. There's no such thing as a free anything. There is always a catch. Delete it!

New Vocabulary

phishing—
an email-based attack to
acquire access,
passwords, bank account
numbers, or credit card
numbers

Security Tips

Threats in cyberspace are real. You can protect yourself. Use antivirus software. Use a firewall and anti-spyware tools. Be careful with attachments from unknown senders. Update passwords. Don't publicize personal information. Monitor your accounts. For more tips, go to Cybersecurity & Infrastructure Security Agency website at <https://www.cisa.gov/cyber-safety>.

Implications for National Security

There is no shortage of high-profile cyberspace operations to illustrate their role in national security. *New York Times* journalist, David Sanger, called governments' uses of cyberspace the "perfect weapon." The Office of Director of National Intelligence explained this in its annual threat assessment. "Cyber threats from nation states and their surrogates will remain acute. Foreign states use cyber operations to steal

information, influence populations, and damage industry, including physical and digital critical infrastructure.” These issues will be explored throughout this unit.

At the international level, there are four countries that pose significant threats to the United States. The Cybersecurity and Infrastructure Security Agency (CISA) regularly releases advisories to improve cybersecurity. CISA also maintains profiles of significant countries and non-state actors’ operations to inform the public better. The following are the four countries and the threat they pose:

1. **The People’s Republic of China (PRC)** is considered the most significant national security challenge facing the United States. China’s military is bigger than the U.S. and threatens U.S. allies in the Indo-Pacific region. China is highly active in cyberspace. It relies on its intelligence services to steal secrets from American corporations to assist its own industries. China also uses social media to censor critics and undermine opposers of official policy around the world. China also targets critical infrastructure, such as natural gas pipelines, to physically damage or disrupt them.
2. **The Russian Federation** is a historic rival of the U.S. It is a major nuclear weapons power and threatens U.S. allies in Europe. Its cyberspace operations are focused on sowing hatred through social media to weaken democracy. Russia is also active against critical infrastructure with the ability to turn off electricity in the U.S. When tensions increase between the U.S. and Russia, the intelligence community warns American companies about Russia’s tactics, techniques, and procedures it uses to conduct harm through cyberspace. The Office of the Director of National Intelligence 2021 Annual Threat Assessment noted, “Russia continues to target critical infrastructure, including underwater cables and industrial control systems, in the United States and in allied and partner countries, as compromising such infrastructure improves—and in some cases can demonstrate—its ability to damage infrastructure during a crisis.”
3. **North Korea** and the U.S. have been in a frozen conflict since 1953. North Korea threatens America’s treaty ally South Korea. North Korea primarily uses cyberspace operations to make money. Through **ransomware** attacks and stealing bank data, North Korean hackers raise money for the government. Sparked by the movie *The Interview*, North Korea attacked Sony Pictures Entertainment in 2015. This was one of the first major cyberspace operations any U.S. president addressed.
4. **Iran** was the victim of a cyberattack against its nuclear program in 2011. Since then, Iran has developed its own cyber capabilities and uses cyberspace operations to target the U.S. government and American firms. Iran used cyberspace to temporarily shut down a hotel in Las Vegas and harassed U.S. banks. CISA warns that Iran “engage[s] in conventional offensive cyber activities ranging from website defacement, **spear phishing**, distributed denial-of-service attacks, and theft of personally identifiable information, to more advanced activities—including destructive malware, social media-driven influence operations, and, potentially, cyberattacks intended to cause physical consequences.”

New Vocabulary

ransomware—*malware that blocks access to a computer until a ransom is paid*
spear phishing—*a phishing method that targets specific individuals or groups*

Conclusion

From a technical perspective, cyberspace encompasses the vast network of interconnected computers that span the globe. This includes the equipment attached to the network, the physical infrastructure of fiber optic cables on land and below the

sea (and in orbit). It also includes the data that is stored and travels across the networks.

The internet is young and rose from the modest Defense Department-funded ARPANET. It became connected to other networks in the U.S. and around the world. Driven by efforts to link scientists and researchers in an era marked by expensive computing, the internet's commercial phase eclipsed its academic origins through several key innovations. These include the shift from mainframe computing to personal computing, the widespread availability of cheap telecommunications, and the friendly business environment for companies to build the internet economy. These innovations had the cumulative effect of broadening the base of participants in cyberspace.

As new technologies come online, society will further deepen its connection to cyberspace. But technology is neither good nor bad. Technology is a tool for good when it is used to solve complex problems, but is a tool for bad when it is used to harass or intimidate.

Critical Thinking

New Vocabulary

cloud
cybersecurity
cyberspace
internet
phishing
ransomware
spear phishing

1. *New York Times* journalist David Sanger called governments' uses of cyberspace operations the "perfect weapons." What are ways governments have used cyberspace operations that contradict how you think the internet should be used? Who should be responsible for protecting cyberspace from these types of operations?
2. Being online exposes you to cyber criminals. Consider ways to prevent your identity from being stolen, your privacy being compromised, or being harassed online. How do you take these prevention ideas and share with your parents to improve their cybersecurity?
3. Look at your most used device and consider how it is vulnerable. Think how it connects to the internet and what data gets exposed when you are not on a secure and trusted network. Review the privacy settings for your apps. Adjust the settings to control who knows where you are, where your pictures were taken, who can download those pictures, and who can connect with you in a private way.

Study Guide Questions

1. What is the internet?
2. Define cyberspace.
3. What is the primary way the continental U.S. is connected to the world?
4. What federal agency regulates where submarine cables land in the U.S. and satellite communications with the ground?
5. What is the difference between phishing and spear phishing?

Threats in Cyberspace

What You Will Learn to Do

Almost every week there is a report of a new cyber incident. Some can be quite small, such as a vulnerability in your phone's operating system. Others can be large, as when ransomware shuts down a hospital or a school. Cyber incidents can also undermine trust within society. Rumor and misinformation spread more easily in cyberspace than they do in real life. It is much easier to share altered photos or false news online. There are many different actors who disrupt cyberspace. Hackers find vulnerabilities for the thrill of the challenge. Bullies have new ways to harass from the safety of their phones. Criminals exploit cyberspace for money. Other countries use cyberspace to steal secrets from the U.S. government and American industry.

Skills and Knowledge You Will Gain Along the Way

- ✓ Understand the range of threat actors in cyberspace.
- ✓ Differentiate the ways in which threat actors work in cyberspace.
- ✓ Learn ways to protect ourselves in cyberspace.
- ✓ Develop an understanding of our social media presence and etiquette.
- ✓ Identify concerns for schools, communities, the Navy, and the country.



Cyberspace is the Fifth Domain of Warfare. Courtesy of DVIDS, Photo by Joseph Eddins

Range of Actors and Methods

Almost everything in the physical world can or will exist in the virtual world. This includes both the good and the bad. You use technology to communicate with friends and family. Criminals use the same technology for financial gain. In fact, technology has made the job of crime easier since there's less physical risk.

For example, the Federal Bureau of Investigation (FBI) reported about 2,400 bank robberies in 2019 with an average loss of \$4,000, which adds up to \$9.6 million for the year.

Cybercrime is different. The FBI's Internet Crime Complaint Center received about 2,000 complaints per day in 2020. Victims reported losses of over \$4 billion! Those under the age of 20 lost over \$400 million. Unlike bank robbery being a federal crime, there is no federal law against using malware for financial gain, only federal anti-hacking laws. And compared to 60 percent of people involved in robberies being identified, very few cyber criminals are identified and even fewer are arrested.



Note

When asked why he robs banks, the criminal Willie Sutton replied, "That's where the money is." As the money shifted from physical storage in banks to online, the criminals moved to cyberspace.

The comparison between physical robbery and cybercrime highlights some important points. First, law enforcement has the legal tools and capabilities to reduce bank robberies. The same cannot be said for cybercrime. Second, physical robbery is a local crime and limited by how much money someone can carry, with the average robber getting \$4,000. Cybercrime is global and highly scalable. For example, one of the FBI's most wanted cyber criminals is based in Nigeria and wanted for robbing 70 businesses for over \$6 million. Third, the process to locate and **attribute** the physical crime is straight forward through evidence collection, interviews, and using surveillance. It is hard to attribute cybercrime to individuals since there is no physical evidence to link to a crime scene.

There have been major efforts within some states, like Maryland, that created specific laws against cybercrime. Federal agencies have also increased their roles in preventing cybercrime. It all starts with understanding malware. *Malware* is short for malicious software that exploits a vulnerability or flaw. It is used to gain access to a system, disrupt internet traffic, and exploit networks. Malware can spread easily when victims unknowingly download files. Malware authors trick their victims into downloading the malware. This can be a text message or email with an exciting offer. It can also be a text message that appears to be from school or the government. If you open the attachment, the malware will install on your system, giving your device's access to someone else.

New Vocabulary

attribute—
*to assign responsibility
for an action*



Cybersecurity is everyone's responsibility. Courtesy of DVIDS, Photo by Jenn DeHaan

Types of Attacks

Just as there are different types of ways to attack from the sea, there is a range of types of attacks in cyberspace. The main difference though is cyberattacks often have a temporary effect. Data can be restored from backups and corrupted machines can be easily replaced. The effects of cyberattacks can be expensive and inconvenient though. Cyberattacks also impact civilians, whereas military attacks tend to be away from the homeland. It is also unlawful for militaries to target civilians intentionally.

New techniques are always being created, but the basic list of attacks are:

- **Distributed Denial of Service** – flood a targeted host or network with traffic until a system crashes.
- **Trojan** – malware that, once implanted or downloaded in a computer, provides remote access to an attacker.
- **Phishing** – social engineering attack that starts when a user clicks on an email or text message tricking them into providing unauthorized access or personal information.
- **Ransomware** – malware that uses encryption to hold a user's information hostage until a ransom is paid.
- **Virus** – malware that attaches to the computer and by user action, replicates itself to slowly infect other computers with the intent of corrupting the system or destroying data.
- **Wiper** – malware that corrupts, erases, or overwrites a computer's memory to make it unusable.
- **Worm** – malware that exploits an operating system vulnerability to independently replicate itself and rapidly spread to uninfected computers over a network. It behaves much like a virus, but is faster and doesn't require activation by its host.

Software companies like Microsoft, Apple, and Oracle are focused on identifying their vulnerabilities and prevent their exploitation. The updates that are pushed to devices happen regularly when new vulnerabilities are discovered. Additionally, the federal government release threat alerts through the Department of Homeland Security and the intelligence community.

New Vocabulary

trojan–
implanted malware that provides remote access to an attacker

virus–
malware that replicates itself to infect other computers

wiper–
malware designed to corrupt or erase a computer's memory

worm–
malware that self-replicates and propagates on its own across a network

Alerts like these offer practical guidance for people who manage information technology networks. The advice can range from turning off certain devices or working with the technology provider for a solution.

Concerns for Students

Just as you would be cautious walking through a dangerous neighborhood, you need to do the same in cyberspace. People can use your personal information to harass you, so make yourself a hard target. Keep your software updated, change passwords, and use multifactor authentication. Remember that when you are online, there is no privacy. Do not say or do things you wouldn't want your family, teachers, or potential employers to see. The internet is forever.

Multifactor Authentication

Multifactor authentication is method to identify the user before granting access to a system. A password plus a code sent through a text is two-factor authentication. A password, a code sent by text, and a user's geographic location or a fingerprint is multifactor.

There are some basic things to do to protect your devices from others. It starts with being aware of spam emails, unknown texts, and fake websites:

- **If the sender of an email or text doesn't look right, don't open it.** This might be an attempt to gain control of your device or download a virus.
- **If it's a website, check the top-level domain (see note below).** In the U.S., all top-level domains do not have a country identifier. For example, to get to the U.S. Navy website, the address is simply *www.navy.mil*. If there is a country identifier, it's a fake, such as *www.navy.mil.ru*.



Note

The domain name system (DNS) is a global directory used to route internet traffic. It is like a telephone book for the internet with each organization having its own location on the internet. It is organized by domains such as .com, .gov, or .mil. When the location is outside of the U.S., a country identifier is required. U.S. based companies do not need to have a country identifier, they can exist just as a .com. The same is not true in the rest of the world. For example, the U.S. version of Amazon is *www.amazon.com*. In Canada, Amazon is *www.amazon.ca* and in Mexico it is *www.amazon.com.mx*.

Computer and Network Security

The internet can be dangerous and there are many examples. In 2015, one bad click shut down the Joint Chiefs of Staff email servers. The phishing attack affected 4,000 personnel in the Pentagon and took experts about eleven days to rebuild the system. This incident and others like it are all too common. People unknowingly give access to dangerous third parties. These outsiders can read others' email, alter files stored on their hard drives, or hold their networks hostage until ransoms are paid.

There are ways to be safer online, but it requires being smart online. Good cyber hygiene is the first line of defense to protect your devices and your privacy. Good cyber hygiene requires us to keep our software updated and have strong passwords, and think before we click. Users should not click links from unknown sources. Human error is often the source of bad cybersecurity. To remedy, the government and many organizations require regular training to improve internet safety. People who manage

the IT systems need to follow good security practices on how the network operates and who can access the network.

There is also an effort to move to a zero-trust environment. This means all users are continuously authenticated, authorized, and validated to be on a network and use the applications. In a regular environment, once you log in, you have access to the system. In a zero-trust environment, your use and access are constantly checked to ensure it is valid.

At home, there are some basic things to do to be smart online:

- **The best passwords cannot be guessed or written down.** Use multifactor authentication to keep your accounts secure.
- **Update your software.** Many cybercrimes occur when people don't patch their software. Unpatched software is the same as leaving your door unlocked.
- **Do not plug unknown devices into your computers.** Many worms spread through infected USB drives and external hard drives. If you don't plug it in, your device can't get infected. Instead, share files through email or a cloud service, which should be checking for known malware.

Digital History

The computer age is an important challenge to our privacy rights. With every download, click, or text sent, we leave a digital history. Most of our activity is good. Our clicks bring us entertainment. We connect with friends and family. We share our favorite playlists, games, and pictures. The Navy uses social media to recruit, share stories, and connect with Sailors' families. These features live up to internet pioneers' visions for a free and open space. We can live, learn, and work from anywhere.

The downside of the openness is this: our internet behavior is forever. Digital pictures posted do not get completely removed. Angry emails or text messages are archived. There is even an internet archive called the "Wayback Machine." It has been building a digital library of hundreds of billions of webpages since 1996. Nothing is deleted. Ever.

The nature of social media makes it nearly impossible to be forgotten in cyberspace. So it's important to future-proof people's impressions of you by thinking before you post. It is tempting to want more followers, shares, or likes, but online behavior has consequences.



Everyone contributes to internet history. Courtesy of DVIDS, Photo by Capt. Chad Nixon

You can, however, be responsible online while having fun. Ask yourself:

- **Would you want your parents, teachers, or company commander to read your accounts?** There's really no such thing as privacy online. Students have been suspended for sending edited photos of their teachers.
- **Do you need to post that now?** Balance emotions with your digital history. Colleges have canceled admissions because of offensive social media posts.
- **Could someone use your activity to bully you or your friend?** Value a trusted group more than a large group. People have been hurt because "private" photos got out.

The Navy does have rules on social media use. Generally, online behavior should not violate the Navy's core values or the Uniform Code of Military Justice.

For example, Sailors cannot like or share extremist videos, they cannot make threats online, and they cannot use social media to stalk others.

Security Tips

Threats in cyberspace are real, but you can protect yourself. Be suspicious of unwanted or unknown emails or text messages. Do not give strangers personal information in email. Avoid non-secure websites. Always look for sites that start with "https." Use multifactor authentication for websites. Remember, the internet is public. Nothing online fully disappears. For more tips, go to <https://www.cisa.gov/>.

Cyberbullying



Don't be manipulated by information thieves. Courtesy of DVIDS, Photo by Petty Officer 2nd Class Isabel Wences

A Pew Research Center study found three out of five teens experienced abusive online behavior. People spread rumors, stalk, and intimidate. Bullies can find your personal information and photographs through your favorite apps and use them against you. Your pictures can also have location data and your apps can share where you are. Just like in real life, there are ways to protect yourself online:

- **Be careful what you post online.** Bullies will misuse personal information that you share with friends and family.
- **Do not react to the bully.** Bullies want you to be scared or embarrassed. Instead, block the messages and report the user. All major social media apps make blocking and reporting easy.
- **Report cyberbullying to your parents or your school.** If the bully is a part of your community, there is a way to stop them. If the person does not live near you, your family and teachers can work to stop them through the app.
- **Intervene as a bystander to support a friend.** Online bullying, **hazing**, harassment, and discrimination is no joke. When a friend is a victim of online abuse, help.

New Vocabulary

cyberbullying—
sending, posting, or
sharing harmful, false, or
mean content about
someone else

hazing—
humiliating and
sometimes dangerous
initiation rituals

Concerns for Schools and Communities

Individuals should be primarily concerned about the loss of privacy online and the long-term implications of online activities. Schools and communities are primarily concerned with protecting their data and their networks. Data loss can mean schools lose personal records for students and teachers. There is also risk to data integrity if electronic files are altered. No one wants their grades changed, for better or for worse.

Loss of network access can also shut down operations. Just like when snow days or hurricanes strike, network outages can now stop school. Lighting, heating, cooling, may all be dependent on a computer network.

Schools and towns are particularly vulnerable to ransomware attacks. Ransomware infects a computer or server and encrypts the data so the computer or server cannot be used. Then, criminals demand payment before providing the decryption key.



The internet is a network of networks. Courtesy of DVIDS, Photo by Staff Sgt. Brendan Stephens

Schools and communities need to make their networks easy to access. This often makes their networks vulnerable to ransomware. In 2020, the FBI received about 2,500 ransomware complaints with losses of \$29 million. The FBI discourages paying ransoms, as ransoms keep criminals in business to do future attacks against others. Furthermore, if a ransom is paid, there is no guarantee the criminal will let the system go. After a major ransomware attack in 2021, the federal government focused its efforts to help stop ransomware.

To protect against cyberattacks, organizations should invest in their cybersecurity and stay current with threat indicators. This means keeping software updated and ensuring devices are properly configured. Those responsible for the network should have a good inventory of what is on the network and who can access it. In addition, organizations should have an incident response plan. Part of the plan is ensuring systems are backed up and infected machines can be easily replaced. The backups should be kept offline and protected until they are needed. Finally, organizations should build relationships with public cybersecurity organizations.

The federal government does offer free vulnerability assessments to state, local, tribal, and territorial governments. There are online resources at www.cisa.gov. The Cybersecurity and Infrastructure Safety Agency (CISA) will test the networks and provide recommendations to improve a school or community's networks. To get started, email CISA at vulnerability_info@cisa.dhs.gov or visit its webpage at www.cisa.gov/cyber-hygiene-services.



Note

You can report cyber crime to the Internet Crime Complaint Center at www.IC3.gov or by contacting the local FBI field office.

Concerns for the Navy and the Country

Cybersecurity is now national security. Foreign governments and their intelligence services use cyberspace operations as a tool of national power. U.S. strategic competitors, such as Russia and China, use cyberspace operations to undermine critical infrastructure in case of war. Developing capabilities to turn off electricity or shut down port operations would provide an adversary serious leverage over the U.S.

I think it's more than likely we're going to end up, if we end up in a war—a real shooting war with a major power—it's going to be as a consequence of a cyber breach of great consequence and [the capability is] increasing exponentially.
~President Joseph R. Biden

New Vocabulary

espionage—
spying or using spies,
typically by governments,
to obtain political and
military information

In peacetime, competitors' intelligence services use cyberspace operations to spy on the U.S. and steal secrets. The Director of National Intelligence, Avril Haines, captured these concerns in the annual threat assessment. "Although an increasing number of countries and nonstate actors have these [cyber] capabilities, we remain most concerned about Russia, China, Iran, and North Korea." Their **espionage** is traditional in nature, such as knowing how many warships are currently deployed. Their espionage is also economic, such as stealing plans for advanced weapons.

The table below lists the typical threats in cyberspace from the various groups:

Threats in Cyberspace	
Other Countries	Gather intelligence, prepare for war, and undermine public trust in the government.
Criminal Groups	Seek monetary gain.
Hackers	Seek the thrill of the challenge to gain unauthorized access to a network.
Hacktivist	Send political messages to promote their cause.
Disgruntled Insiders	Cause damage to a system or steal data to sell.
Terrorists	Attack critical infrastructure, recruit, and promote their acts.

The Department of Defense sees cyberspace as the fifth domain of war. The four others are air, land, maritime, and space. All the military services rely on cyberspace for its operations. U.S. Cyber Command was created in 2010 to lead defensive and offensive operations. Headed by a four-star general or flag officer, the Commander of U.S. Cyber reports directly to the Secretary of Defense.



The Department of Defense has Cyber Operators to protect networks. Courtesy of DVIDS, Photo by Joseph Eddins

When at sea, the Navy needs cyberspace to link ships and headquarters. These connections are made through space-based satellites and ground stations. While space-based, the global position system is critical to navigation and weapon systems. Space-based systems can be vulnerable to adversaries' missiles and malware.

The Navy maintains a separate command called U.S. Fleet Cyber Command. The admiral also commands U.S. Tenth Fleet. Both are explored later in this unit. Fleet Cyber/Tenth Fleet play important roles in protecting defense networks and developing tools for offensive cyberspace operations.



Note

U.S. Fleet Cyber Command reports directly to the Chief of Naval Operations.

Election Interference



Foreign governments use social media to sow dissent. Courtesy of DVIDS, Photo by William King

Foreign governments try to influence the policies of other countries. This can be by supporting candidates or undermining electoral processes. Social media apps have given foreign governments new ways to reach large amounts of voters. The 2016 U.S. presidential election was the first time there were widespread efforts to interfere in the elections.



The U.S. Intelligence Community assessed Russia interfered in the presidential election. Courtesy of the Office of the Director of National Intelligence

After the election, the U.S. intelligence community assessed foreign interference. Its report is publicly available on the website of the Office of Director of National Intelligence. Among the findings are:

- Russia's goals were to undermine public faith in the U.S. democratic process.
- Russian strategy blended covert intelligence operations with official statements. Russia also paid social

New Vocabulary

troll—
harass someone online to try to get a negative reaction

media users to **troll**.

- Russian military intelligence targeted Republican Party and Democratic Party headquarters. They released sensitive information to media outlets.

One of the most effective actions was the release of Democratic Party sensitive information. This was done through spear phishing. An email was sent to the head of the Democratic National Committee. The email appeared to be from Google saying his password had to be changed. The person did not recognize the email as fake and clicked on the link. This gave Russian intelligence access to his account. Then the Russian operatives stole sensitive documents, shared with media outlets using a fake name, and the efforts damaged the Democratic Party's campaign.

The U.S. intelligence community assessing Russian intelligence **election interference** would be the new normal. Congress responded with many efforts to protect democracy from foreign interference. Among these efforts was the creation of CISA in 2018. In the run-up to the 2020 election, CISA worked successfully with the state and local governments to ensure ballot counts were not altered. There were, however, continued efforts to influence the 2020 election. The U.S. intelligence community identified multiple countries releasing fake news. Foreign intelligence also used social media to promote misinformation to undermine public confidence in the electoral process.

New Vocabulary

election interference—*foreign efforts to affect an election's outcome by targeting candidates, political parties, or political processes*

Economic Espionage

The U.S. has the largest economy in the world and is home to the most innovative industries. Boeing is a global leader in making aircraft. Raytheon is a global leader in making missiles. General Electric is a global leader in making wind turbines. Microsoft is a global leader in software development. Pfizer is a global leader in biotechnology and makes vaccines. These companies export or sell their products around the world. Companies in other countries want to compete, so they resort to stealing our trade secrets through **economic espionage**. China, Russia, and Iran are the most capable and active countries that use cyber theft of U.S. intellectual property for their own industries.

In one case, an officer who works for China's Ministry of State Security (MSS) recruited a General Electric IT worker to plant malware on a company laptop. With access to GE's network, the MSS was able to steal fan blade technology that can be used in China's industry.

The FBI is responsible for reducing foreign intelligence activities and economic espionage in the U.S. The goals of the FBI's **counterintelligence** program are:

- Protect the secrets of the U.S. Intelligence Community, reduce espionage, and counter the insider threat.
- Protect the country's critical assets in defense, intelligence, economic, financial, public health, and science and technology.
- Counter foreign spies in the U.S.

Within the Navy, the Naval Criminal Investigative Service (NCIS) works to prevent spying and protect the defense industrial base from foreign intelligence. Foreign operatives often use social media posts to identify people's interests to recruit them. NCIS is the Department of Navy's lead agency to conduct offensive counterintelligence to neutralize foreign intelligence services.

New Vocabulary

economic espionage—*a foreign effort to influence economic policy decisions or steal financial, trade, or economic policy information*

counterintelligence—*activities aimed to protect secrets and reduce the activities of foreign spies*



Naval Criminal Investigative Service is the Navy's lead counterintelligence agency. Courtesy of NCIS

Conclusion

The internet was created to make communication easier. Access is easy and devices are everywhere. Social media has proven to be a great internet innovation. Students can reach out to others around the country for research. Midshipmen can learn more about deployed ships and life in the Navy.

The list of concerns in cyberspace for individuals is long. In the physical world, there are doors, gates, and fences to separate where someone can walk or who can come into your home or school. In cyberspace, there are no limits. If you don't manage your privacy settings, people anywhere can see what you post forever. The photo you shared with a close friend is not private. Those we let into our virtual lives can use our posts to bully or annoy. This forces all of us to take our personal cybersecurity seriously.

The Navy now operates in the cyber domain. With a large information warfare community, it is charged with defending networks and is ready to conduct offensive attacks. There is much to learn and understand how cyberspace operations work in peace and in war. But one thing is for certain, cybersecurity is a part of national security.

Critical Thinking

1. Search your name online. What can the world know about you? What platforms know more about you than other ones? What types of photos are there? Can someone find out where you live? What would your 30-year-old self learn about you?
2. Review your pictures and videos. How was your location captured? If you posted or sent the pictures, look at the app's terms of service. How long will your pictures be stored on their site? Can the site use your pictures without your permission?
3. Go to the FBI's Internet Crime Complain Center at www.ic3.gov. Notice what are the most common types of complaints received. What was the source of the complaint? What are the overall consequences? What are things you can do to avoid being a victim online?
4. Review the Director of National Intelligence annual threat assessments at www.dni.gov. How is cyber discussed in the reports? What are the main countries identified as threats? What other organizations are listed as threats? Consider how cyberspace operations makes the U.S. vulnerable.

New Vocabulary

attribute
counterintelligence
cyberbullying
economic espionage
election interference
espionage
hazing
trojan
troll
virus
wiper
worm

Study Guide Questions

1. What is an example of multifactor authentication?
2. What are the types of social media activities the Navy bans?
3. What can you do to reduce cyberbullying?
4. What type of attack tricks a victim into clicking on a link or replying to a message that gives the sender access to your system?
5. What type of malware blocks access to a computer until money is paid?
6. What federal agency offers free vulnerability assessments to state, local, tribal, and territorial governments?
7. Where can you report a cybercrime?
8. How do other countries use cyberspace operations against the U.S.?

Web Resources

Cybersecurity and Infrastructure Safety Agency (CISA): www.cisa.gov

CISA email: vulnerability_info@cisa.dhs.gov

Internet Crime Complaint Center: www.IC3.go

National Policies on Cybersecurity

What You Will Learn to Do

The United States is a global leader that projects influence in many ways. The U.S. is home to many leading universities and research centers. Leading technology companies are based in Washington, California, Massachusetts, and Texas. This fact often makes U.S. technology standards global technology standards. The U.S. government largely takes a hands-off approach to business. Instead, American society and culture create an environment where individuals can transform simple ideas into multi-billion-dollar companies with little interference from government. This is relatively unique in the world.

Skills and Knowledge You Will Gain Along the Way

- ✓ Appreciate the state of internet freedom.
- ✓ Identify ways governments undermine internet freedom.
- ✓ Understand how cyberspace operations are a tool of national power.
- ✓ Understand U.S. international strategy to improve cybersecurity.
- ✓ Recognize the roles the federal, state, and municipal governments play in cybersecurity.



Cyberspace is the Fifth Domain of Warfare. Courtesy of iStock, Credit traffic_analyzer

International Strategy

The internet was invented in the United States, and the nature of the U.S. economy gave rise to the information age for the world. This has brought great benefit to Americans who have smart phones, streaming services, and online resources to learn more. The government largely had a hands-off (or laissez-faire) approach to the internet. This enabled companies the chance to innovate, fail, and innovate again. This formula is part of U.S. foreign policy that promotes openness and trade.



Note

The Department of State is the principal foreign policy agency in the U.S.

The U.S. government is also a leading voice on cyberspace issues. President Barack Obama captured the American spirit when he released the first *International Strategy for Cyberspace*.

The digital world is no longer a lawless frontier, nor the province of a small elite. It is a place where the norms of responsible, just, and peaceful conduct among states and peoples have begun to take hold. It is one of the finest examples of a community self-organizing, as civil society, academia, the private sector, and governments work together democratically to ensure its effective management. Most important of all, this space continues to grow, develop, and promote prosperity, security, and openness as it has since its invention.

~President Barack Obama

Internet Freedom Today

Most Americans enjoy internet freedom. Americans can buy phones or tablets to access the internet and surf until their parents say no. You can make a short video to share with friends or post through an app. You can also change or hide your identity on the internet. No photo ID is required to play Pokémon, watch TikTok, snap, tweet, or post. This is not true globally.

The U.S.-based think tank, Freedom House, does an annual analysis of internet freedom. In a recent report, it concluded:

*Internet freedom is increasingly imperiled by the tools and tactics of digital authoritarianism, which have spread rapidly around the globe. Repressive regimes, elected incumbents with **authoritarian** ambitions, and unscrupulous partisan operatives have exploited the unregulated spaces of social media platforms, converting them into instruments for political distortion and societal control.*

The U.S. ranks high on the list of "most free" countries but is not in the top five, due to the costs of internet access and the growth of false information online.

New Vocabulary

authoritarian—
form of government that is highly centralized and favors complete obedience

Internet Freedom in the World

Top 5 "Most Free"	Bottom 5 "Least Free"
Iceland	Cuba
Estonia	Vietnam

Top 5 "Most Free"	Bottom 5 "Least Free"
Canada	Syria
Germany	Iran
United Kingdom	China
Adapted from Freedom House, "Freedom on the Net."	

Around the world, governments attempt to control their populations by controlling the internet. Some governments block popular sites like YouTube. Some governments impose limits on what sites can be visited, what apps can be downloaded, and what can be posted. People are arrested for posting political or religious content online. Authoritarian governments even use filters to block content to censor what people chat or post about. Social media companies might do some of this in the U.S., but it is not the federal government.

Content **regulation** or **censorship** may seem foreign to Americans who experience cyberspace as relatively free. However, it is important to note that technology companies do use filters to screen out pornography, hate speech, and extreme violence online. Authoritarian countries simply extend this principle to threats to their political monopolies or cultural values. This type of censorship undermines internet freedom. U.S. foreign policy fights this and promotes internet freedom.

New Vocabulary

regulation—
the rules government uses to impose restrictions or control

censorship—
government suppression of free speech or other forms of communication

Information Sharing



The U.S works closely with other countries to share information. Courtesy of DVIDS, Photo by Ed Drohan

As of 2022, about two-thirds of the world’s population used the internet on a regular basis. With so many users, there are efforts to improve cybersecurity through information sharing among governments. This is an important change. Most of the internet’s history can be considered decentralized with lack of government intervention. Technologists were the main contributors to sharing information on technical rules to improve data flow efficiency. Governments are now cooperating to

share ways to protect and secure data. Since the internet is intertwined with society, governments are getting more involved to promote public security and online safety.

The United Nations (UN) has made important contributions to international cooperation. The United Nations is a multilateral organization made up of **sovereign governments**. The UN cannot impose laws on other governments. Instead, governments work through UN committees and specialized organizations to share information and make agreements. These include organizations like:

- World Health Organization (WHO) that works on public health.
- International Atomic Energy Agency that promotes arms control.
- International Maritime Organization that promotes safety and security at sea.
- International Telecommunications Union that works on digital communication.

In all these organizations, countries propose rules for issues that are global.

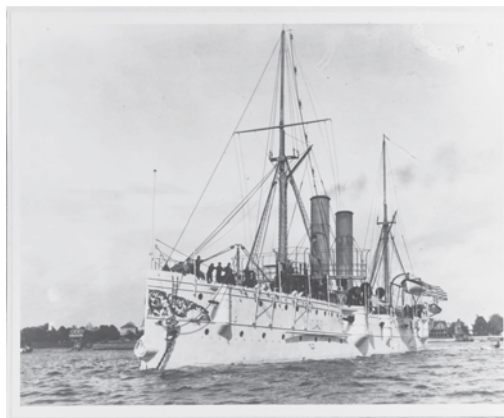
Cyberspace Operations as a Tool of Power

Governments engage internationally through various tools of power. A quick way to remember the tools of power is through the DIME acronym. DIME stands for **d**iplomacy, **i**nformation, **m**military, and **e**conomic. Cyberspace operations are a part of all four of the tools. Cyberspace is a part of diplomacy when the Secretary of State goes to the United Nations to promote norms of behavior. It is a part of information when the Department of State broadcasts news to Cuban televisions and radios. It is a part of the military when U.S. Cyber Command defends military networks from malware. It is a part of economic tools when the Commerce Department promotes sharing **encryption** tools to make banking more secure around the world.

Cyberspace operations generally refer to a military's use of cyberspace. The effects of cyberattacks are often temporary since systems can be restored from back-ups. For more permanent effects, the physical aspects of networks can be targeted. For example, during the Spanish-American War of 1898, Marines and Sailors from the USS *Marblehead* (C 11) and USS *Nashville* (PG 7) cut the trans-oceanic cable that isolated Cuba from Spain.

In contrast to 1898 when there was just one cable connecting Cuba to Spain, there is much redundancy in the system today. Undersea cables and space-based internet satellites connect the planet. If undersea cables were cut, there is generally a way to stay connected. For governments to gain benefits from cyberspace operations, they generally focus on intelligence collection, influence operations, or network disruption. *Influence operations* are the spreading of **propaganda**, lies, and **misinformation**.

Unfortunately, other governments frequently target the U.S. through cyberspace operations. Russia has regularly attempted to influence elections. Russia creates fake accounts to spread lies and undermines American democracy. The People's Republic of China (PRC) widely uses cyberspace operations to conduct economic espionage. The PRC steals trade secrets from American companies to support its own companies. Iran uses distributed denial-of-service attacks against U.S. companies



During the Spanish-American War, Sailors from the USS Marblehead cut the trans-oceanic cable isolating Cuba from Spain. Courtesy of National Archives

New Vocabulary

sovereign government—
a recognized government with a defined territory with just one dominant power

New Vocabulary

encryption—
the process for encoding information to prevent unauthorized access

New Vocabulary

propaganda—
biased or misleading information used to promote a political cause
misinformation—
false information designed to deceive

and organizations. North Korea uses ransomware attacks to generate money to finance its own government.

The examples above illustrate that cyberspace operations generally support larger national policy objectives. Governments generally don't use cyberspace operations to try something; governments want something. Additionally, cyberspace operations should be conducted in accordance with existing international law. The government should apply the same legal restrictions when conducting an armed attack regardless of whether it is through a missile or malware. These legal restrictions include:

- Operations should be necessary to provoke an enemy to stop its actions.
- Operations should distinguish between civilian and military targets. The civilian population and systems should be off-limits.
- Operations should be proportional. Operations should not cause excessive suffering, injury, or destruction to civilians.



U.S. Cyber Command tracks real-time cyberattacks. Courtesy of DVIDS, Photo by Joseph Eddins

Not all cyberattacks are armed attacks. Policymakers decide and interpret each cyberspace operation separately. This is based on several factors. First, cyberspace operations should produce damage comparable to a physical attack. It does not matter if a missile or malware caused destruction. Second, determine whether another government launched the cyberspace operation. This requires attribution or blaming another government. Third, the operation should be identified in a reasonable time. As discussed in the previous chapter, this can be hard as network breaches often take months to discover.

Domestic Strategy

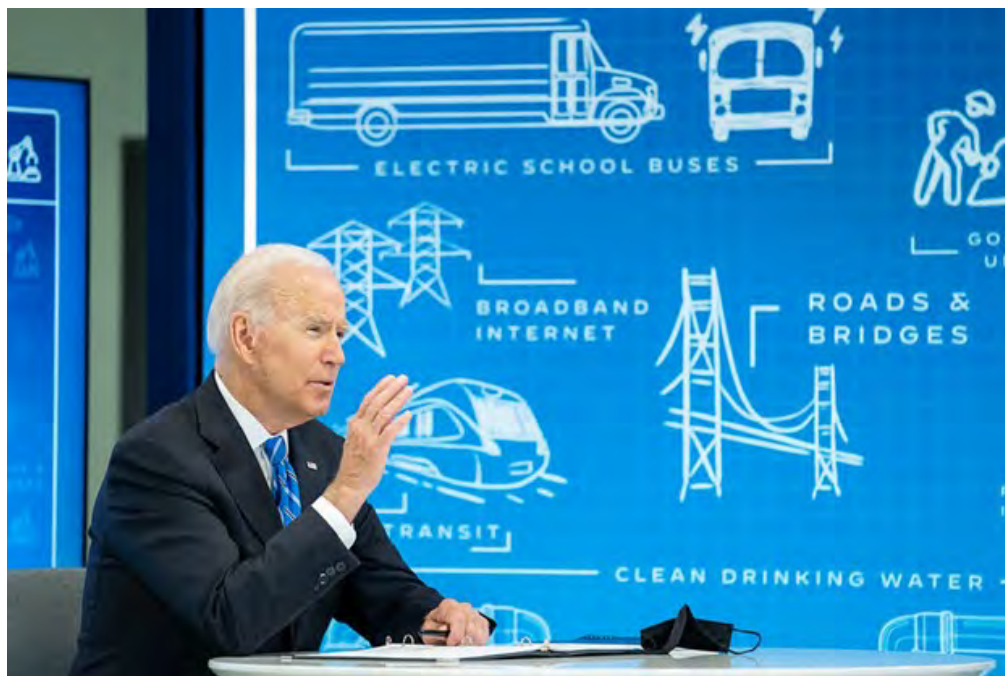
Government in the U.S. is largely decentralized. There is one federal government in Washington, D.C. There are 50 state governments, but also thousands of city, county, and local governments. Most things that touch our daily lives are at the state level, such as school standards and driver's license requirements. If you commit a crime, you are likely violating a state law. Marriages, births, and deaths are often recorded at

the county level. Business licenses can be at the state or city level. This broad approach to governance is relatively unique to the U.S.

Technology Policy

You can see the free market at work if you were to crack open your phone. The overall design of your device is likely American. The screen is likely made in South Korea. The main processing chip is likely made in Taiwan. The primary materials were mined in Latin America, Central Asia, or Sub-Saharan Africa. And all of this was likely assembled in a factory located in the People's Republic of China. Your now disassembled phone tells the story that there is no U.S. government technology policy that created your phone. Instead, technology companies are relatively free to make the best phone possible free of government interference. Technology companies can source materials and assemble where they find it best for their business.

On the one hand, this is good and consistent with American history where government largely takes a laissez-faire role in the economy. On the other hand, there are serious concerns about sourcing components from around the world. The U.S. Government Accountability Office notes that harmful software can be installed in U.S. sold devices. Foreign governments may create malicious code in hardware that can disable the hardware in time of conflict. The White House has agreed with these concerns. President Joseph R. Biden worked with industry to create new semi-conductor factories in the U.S. to safeguard against foreign interference.



President Joe Biden explaining the importance of modernizing infrastructure and technology. Courtesy to The White House, Photo by Adam Schultz

Public-Private Partnerships Matter

Although the internet is publicly available, it consists of privately owned computers and networks. The private sector primarily designs, builds, owns, and operates the internet. With the threats to individuals and communities growing, there is a demand for greater governmental involvement.

The Defense Department is responsible for ensuring the .mil domain remains safe, while the Department of Homeland Security (DHS) oversees security of the .gov

domain. DHS provides support to critical infrastructure such as power companies, but electricity generation and distribution is in private hands. The .com and other non-governmental domains are entrusted to the organizations that operate them.

If there is a physical emergency, you can reach the police by dialing 911. There is no equivalent for crimes in cyberspace. This arrangement, where the public uses private services, has led to the demand for public-private partnerships. The U.S. intelligence community regularly posts announcements of cyber vulnerabilities that the private sector can use to improve cybersecurity. When the private sector identifies malware, it can share associated information through government-sponsored information sharing organizations. The shared goal of better cybersecurity is bridging the divide between government and corporations.

New Vocabulary

oversight–
the act of watching or
overseeing something

Role of Congress

Congress is the first branch of government. It makes all laws and provides important **oversight** on the president who executes the laws. Congress is intended to be the most representative body in government. With 535 elected Representatives and Senators, they can meet and talk to more citizens than a single president can. Members of Congress are subject to re-election but do not face term limits like the president. This gives members and their staff more time to consider issues.



Congress is a coequal branch of government and plays an important role in policy making. Courtesy of The White House, Photo by Adam Schultz

Congress has played a limited role in technology policy and law. The U.S. does not have a comprehensive cybersecurity law like other countries. Companies are not required to report data breaches. There are no federal laws against ransomware or denial-of-service attacks. Congress has held many hearings on social media and the size of technology companies. So far, Congress has largely pursued a laissez-faire approach to policy.

There are some very specific laws that apply in cyberspace, however. First, the Constitution protects individuals' privacy rights from government. This protection does not apply to companies whose applications individuals use. For example, Twitter can ban someone's use (even the president) if they violate the terms of service.

Second, there are anti-hacking laws. It is a federal crime to access a protected computer without consent with the intent to cause harm or to commit fraud.

Role of State and Municipal Governments

State and municipal governments are mainly responsible for public safety and security in the U.S. If you call 911, it will be a local fire department, ambulance, or police who respond. Building on this tradition, many states have created cybersecurity commissions to coordinate state government agencies. Additionally, some major cities have cybersecurity commands to share expertise and assist schools, hospitals, and businesses.

In the absence of federal law, state legislatures are passing laws to protect people in cyberspace or limit the use of technology. The National Conference of State Legislatures provides a comprehensive list of cybersecurity legislation. Below are some examples of state cybersecurity laws:

- [California Privacy Rights Act of 2020](#). This protects individuals' privacy with corporations who collect Californians' data. Citizens can request that businesses delete any personal information. Citizens can also request a business to correct inaccurate personal information.
- [Washington Restriction on Use of Facial Recognition Services of 2021](#). This law prohibits the use of a facial recognition service for ongoing surveillance, real-time identification, or tracking without a warrant or court order. It prevents law enforcement from using facial recognition as the sole basis to establish probable cause.
- [Maryland passed an anti-ransomware law in 2020](#). The law prohibits the possession of ransomware with the intent to use. The law specifically makes it a crime to use ransomware against a state agency, a public service company (such as electricity), a health care facility, or a public school.

Additionally, major cities are passing laws to provide greater protections in cyberspace and protect people against technology. Here are a couple examples:

- [New York City Council passed the Automated Employment Decision Tools law of 2021](#). It became unlawful for an employer to screen job candidates using machine learning, artificial intelligence (AI), or other computational processes. It was passed in recognition that artificial intelligence tools show the same biases humans do.
- [Cambridge, Massachusetts banned the use of facial surveillance in 2020](#). The ban happened because facial recognition tools exhibited racial or gender bias.

Conclusion

The hands-off approach that facilitated the rise of the U.S. as a superpower also exposes Americans to risks in cyberspace. Foreign governments use cyberspace operations to undermine the U.S. politically and economically. Criminal groups use ransomware and identity theft for money. This was possible due the innovations created in the U.S. and the relatively open environment where government does not play a comprehensive role in cyberspace.

This is changing. Internationally, the U.S. has been promoting norms to improve cybersecurity. Domestically, Congress has passed some laws related to hacking. State and city governments are filling the space with laws that ban certain uses of technology and making ransomware a crime. The next chapter reviews federal roles more to see how key government agencies are working to improve cybersecurity.

Critical Thinking

New Vocabulary

authoritarian
censorship
encryption
misinformation
oversight
propaganda
regulation
sovereign government

1. The U.S. is home to leading information technology companies. The U.S. is also a leading country in the world. In what ways do Americans benefit? What are the challenges Americans face from other countries when they use cyberspace operations?
2. Review the list of norms for governments in cyberspace. What norms should be added? What norms should users expect from information technology corporations? What norms should guide individuals in cyberspace?
3. The National Conference of State Legislatures provides a comprehensive list of cybersecurity laws. Review the list. Consider what states have more cybersecurity laws than others. Notice trends in types of laws that address vulnerabilities or types of cyber acts. Since national laws can develop from state laws, which ones should Congress consider?

Study Guide Questions

1. What term describes why the national government has largely left cyberspace unregulated?
2. What United Nations organization works on digital communication issues?
3. What is an accepted form of behavior called?
4. What does DIME stand for?
5. What federal department protects the dot-gov domain?
6. What protects an American's privacy from the government?

Federal Roles and Missions

What You Will Learn to Do

The federal government took a more active role in cybersecurity over the last decade. The Department of Defense embraced cyberspace as an operating domain like it does with the maritime and air domains. Cyberspace operations are now being added to military plans.

The Federal Bureau of Investigation (FBI) regularly investigates crimes committed through cyberspace and makes arrests. The Department of Justice prosecutes those accused of misusing cyberspace.

Skills and Knowledge You Will Gain Along the Way

- ✓ Understand the roles and missions of key federal agencies involved in cybersecurity.
- ✓ Explain why Congress created the Office of the National Cyber Director and the Cybersecurity and Infrastructure Security Agency.
- ✓ Understand the relationship among the Homeland Security, Justice, and Defense Departments.
- ✓ Consider how the intelligence community supports cybersecurity.
- ✓ Appreciate why the Commander of U.S. Cyber Command is dual hatted as the National Security Agency Director.
- ✓ Understand how the military services support U.S. Cyber Command.



White House Situation Room meeting. Courtesy of The White House, Photo by Erin Scott

White House



U.S. Navy Ceremonial Guard at the White House. Courtesy of DVIDS, Photo by Stephen Hassay

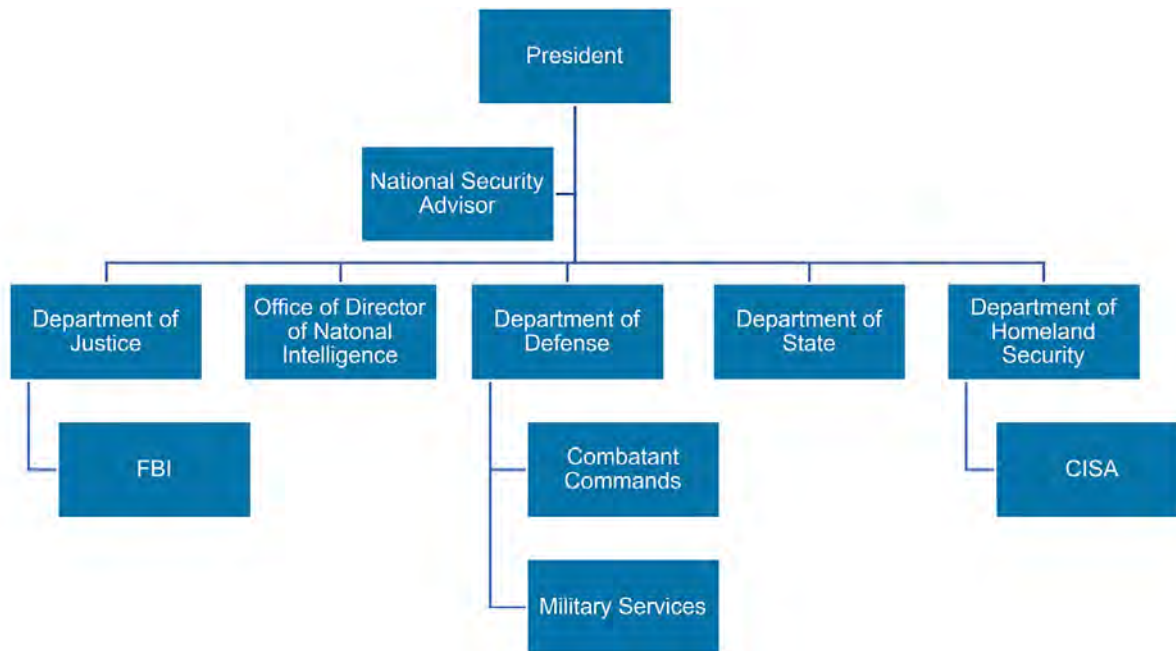
New Vocabulary

discretionary spending—*within the federal budget, spending that is considered optional and is subject to annual approval*

The U.S. national security system is large. It includes national defense and foreign policy. By dollars, national security spending is the largest **discretionary spending** program in the federal budget. Most people working for the federal government support national security. Millions of people work for the Department of Defense and hundreds of thousands of people work for the Department of Homeland Security. There are American diplomats in almost every country in the world.

By law, the president leads the national security system. The Constitution states that the president is the commander-in-chief of the armed forces. The president can deploy military force, declassify sensitive topics to promote information sharing, and set national defense priorities. The president is also the chief diplomat who negotiates treaties. In this role, the president can promote international initiatives and can set priorities at international institutions, such as the United Nations and the North Atlantic Treaty Organization (NATO).

The president has many advisors to manage the national security system. At the top of each federal department is a cabinet secretary. Cabinet officials, like the Secretary of Defense, must be confirmed by the Senate. The Secretary of Defense leads the three million-strong department and represents the president before Congress and around the world. The secretary works to ensure military personnel and defense civilians have the training and resources necessary to protect the U.S.



The President and Key National Security Departments. Courtesy of whitehouse.gov

The president has other officials who work in the White House. A key person is the National Security Advisor. Every day, the advisor works directly for the president to make national security decisions. National Security Advisor coordinates defense, trade, and foreign policy discussions. The advisor can be an active-duty officer or a civilian who has expertise. In either case, the National Security Advisor relies on expertise from across the government and society.

National Cyber Director

Congress created the position of National Cyber Director in 2020. The first one entered office in 2021. The director works for the president to focus federal cybersecurity efforts. The director plays an important role in building relationships between government and the private sector. The director can bring together tech leaders and key government leaders to improve cybersecurity. For instance, cyberattacks happen through Microsoft products, so it makes sense to have Microsoft at the table to discuss.

As discussed in the previous chapter, the U.S. government generally does not direct the private sector. Instead, it creates a set of voluntary standards. This may be changing though. After some major cyber incidents, the government now requires pipelines and trains to report breaches within 24 hours. This directive may follow for other industries.



The President meets with private sector leaders to discuss cybersecurity. Courtesy of The White House, Photo by Adam Schultz

The director is the president's representative and can direct the federal government to ensure its systems are secure. For example, the president issued an executive order that national security networks and federal civilian networks must meet the same standards. Adversaries look for weak links. The president also ordered that software the government buys must meet certain security standards. This will raise security standards for society since companies probably do not want to make software for the government and some for schools. Instead, companies will most likely make one version with high standards for everyone.

Almost every government agency now has cybersecurity concerns. Certain government agencies have large roles to play in strengthening security in cyberspace. The national cyber director works to coordinate actions with these key actors. This includes having a standard set of responses to when a major cyber incident occurs.

Department of Homeland Security

Congress created the Department of Homeland Security (DHS) in 2002. The September 11, 2001 terrorist attacks that killed 3,000 Americans prompted this. Prior to creating DHS, the country did not have a single federal department to protect America's borders, airports, and ports. The creation of DHS combined 22 different federal organizations. With about 250,000 employees, DHS is focused on protecting the United States. It also assists with recovery after major natural disasters and promotes resilience.

In the 2010s, other countries began to use cyberspace operations against the U.S. government and country. The *New York Times* journalist David Sanger called these cyberspace attacks the "perfect weapon." Adversaries far from American shores can steal data or shut down companies. This often occurs without knowing who did it.

After some major cyber events, President Obama designated DHS to lead the government's cyberspace defenses. To provide more resources to DHS, Congress created the Cybersecurity and Infrastructure Agency (CISA) in 2018.

Cybersecurity and Infrastructure Agency

CISA leads the national effort to understand and manage risk to cyber and physical infrastructure. Located in Washington, D.C., it is the key bridge between the government and the private sector. CISA has three main tasks:

- **Serves as the lead for federal cybersecurity in the dot-gov domain.** In this role, CISA works closely with the intelligence community and the Department of Defense.
- **Coordinates national cyber defense.** CISA responds to major cyberspace operations that impact the U.S. It shares information to prevent attacks and to recover from incidents.
- **Builds partnerships across the public and private sectors.** It also builds relationships with schools and international partners. Through its website, you can request a speaker for your school.



Seal of Cybersecurity and Infrastructure Security Agency. Courtesy of CISA

To do their jobs, DHS and CISA organize its efforts into 16 infrastructure sectors. This list of critical infrastructure helps make information sharing easier. For example, if one power company faces ransomware attacks, other power companies may see the same attack and can work to prevent it. Security bulletins can be tailored by sector and CISA provides warnings when necessary.

Critical Infrastructure Sectors		
Chemical	Commercial Facilities	Communications
Critical Manufacturing	Dams Sector	Defense Industrial base
Emergency Services	Energy	Financial Services
Government Facilities	Healthcare and Public Health	Information Technology
Nuclear Reactors, Materials, and Wastes	Transportation Systems	Water and Wastewater

CISA offers free services to help schools, community organizations, and critical infrastructure to improve cybersecurity. They provide vulnerability reports and recommendations to improve security. CISA uses adversaries' tactics to test network defenses if a community invites it. CISA also offers many online resources to improve cybersecurity for everyone.

Security Tips

Threats in cyberspace are real. You can protect yourself. Report suspicious behavior to CISA. Be prepared for a cyberattack. Backup your data. Review alerts at the National Cyber Awareness System. Apply lessons from known incidents. For more tips, go to www.cisa.gov.

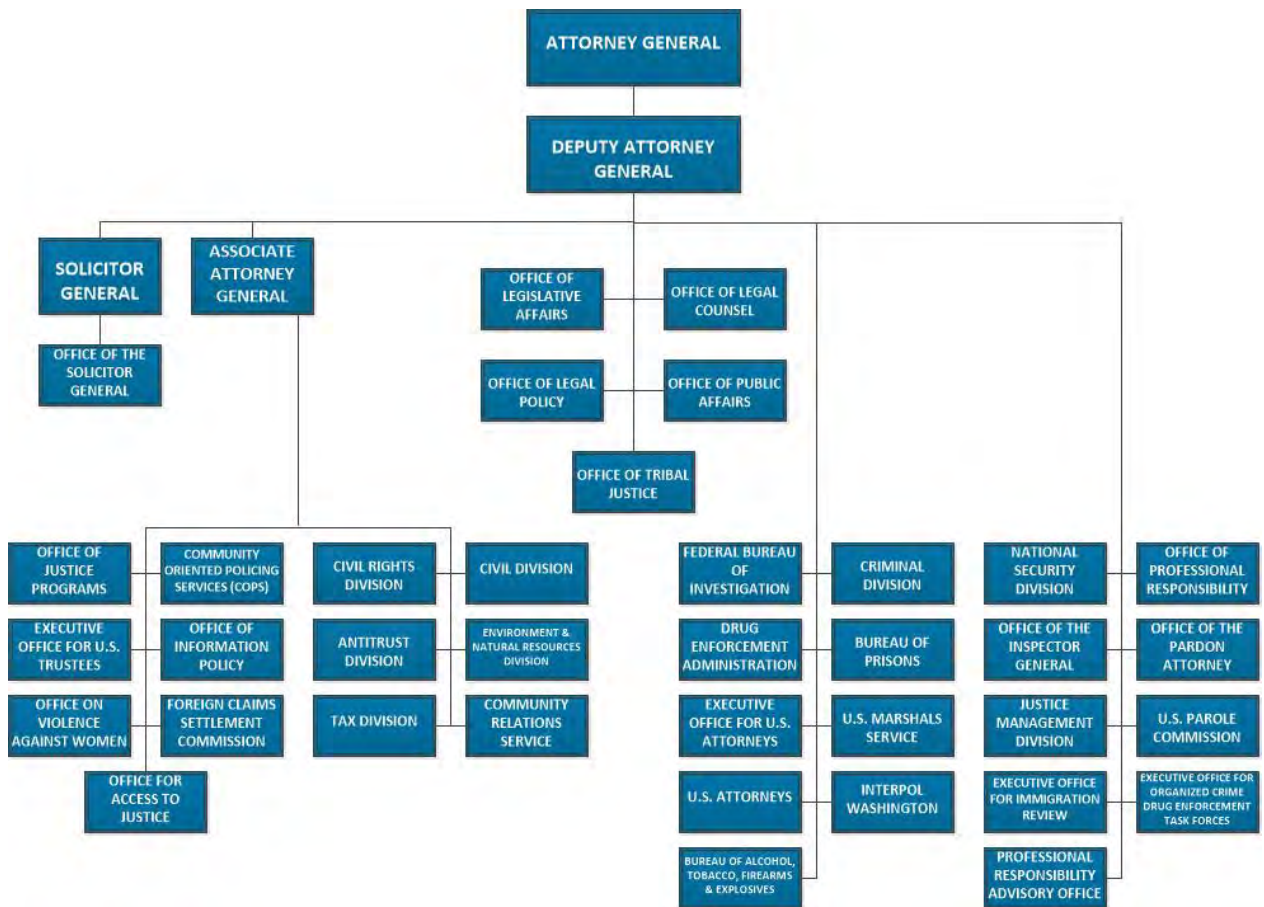
Department of Justice

New Vocabulary

prosecute—
present formal charges
against someone in a
court of law
indictment—
a formal legal charge
brought against an
individual or organization

The Department of Justice (DOJ) is rooted in the country’s founding. President George Washington appointed the first Attorney General who leads the DOJ. Its role is to enforce federal law, promote public safety, and ensure justice for all Americans. The Attorney General has representatives throughout the country and its territories to **prosecute** criminal and civil cases. It is known as the world’s largest law office with United States attorneys representing the federal government in the court system.

Each U.S. attorney is appointed by the president and confirmed by the Senate. The DOJ relies on federal law enforcement officers to identify evidence of wrongdoing. The DOJ brings **indictments** against those alleged to have committed crimes. The DOJ prosecutes a range of cases varying from hate crimes to cybercrimes. For example, the National Security Division prosecutes crimes such as attacks on the electricity power grid and economic espionage. The DOJ works with foreign governments to bring attackers to justice in the US.



The Attorney General is the leader of the Department of Justice Courtesy of the Department of Justice

Federal Bureau of Investigation

It might be the most recognizable due to movies and television shows, but the FBI is one of many federal law enforcement organizations that fall under the Department of Justice. The DOJ also includes the Drug Enforcement Agency, the Marshals Service, and the Bureau of Alcohol, Tobacco, and Firearms.

The FBI is also a member of the intelligence community. It has a presence in every major city of the U.S. through field offices and resident agencies. It also has agents in some U.S. embassies and consulates around the world.

Many of the missions overlap, but the FBI's top priorities are:

- Protecting against terrorist attacks, foreign intelligence operations, and espionage.
- Combating significant cybercrime and public corruption.
- Protecting civil rights.
- Combating transnational criminal enterprises.
- Combating major white-collar crime.
- Combating significant violent crime.

The FBI is the lead federal agency for cybercrime and coordinates the overall federal response to an emergency. The FBI investigates criminals who use ransomware. It investigates foreign intelligence services who steal America's secrets. It investigates foreign governments who interfere with America's elections. The investigations can lead to prosecutions by the Department of Justice.

With squads of cyber-trained special agents, intelligence analysts, and computer scientists, the FBI uncovers the sources of malicious activity in cyberspace. It works with other organizations through the National Cyber Investigative Joint Task Force (NCIJTF). It releases advisories to warn people responsible for protecting computer networks.

The FBI created the Internet Crime Complaint Center as a way for individuals or businesses to report cybercrime. In 2020, the FBI received almost 800,000 complaints. Americans reported losses of over \$4 billion and asked the FBI for help to recover the funds. Phishing, identity theft, and harassment top the complaint list. You can submit complaints at www.ic3.gov.



The FBI can search its fingerprint database to solve crimes. Courtesy of iStock, Credit maxkabakov

Department of Defense

The Department of Defense (DoD) is charged with protecting America. It is the most funded organization within the government, and it is the largest. The DoD is highly organized with clear chains of command. The two basic organizations within the DoD are the military services and the combatant commands.

A *military service*, like the Navy, has clearly defined roles in law and policy. The head civilian of the Navy is the Secretary of the Navy. The secretary oversees the Chief of Naval Operations (CNO) and the Commandant of the Marine Corps. These service chiefs recruit and train Sailors and Marines. The CNO and the commandant make recommendations on military requirements to meet the needs of combatant commands.

Combatant commands are **joint** commands composed of people from all military services. Sometimes, foreign officers also serve in combatant commands. There are geographic combatant commands, like U.S. Indo-Pacific Command located in Hawaii. There are also functional combatant commands, like U.S. Cyber Command located in Maryland. Combatant commands develop military plans and when ordered, they direct the fighting. To be effective, combatant commands request military forces from the military services, specify types of equipment to buy, and identify types of training needed.

New Vocabulary

joint–
activities, operations, or organizations in which two or more military departments participate

The U.S. is just like other governments around the world that developed cyber commands. The U.S. is attempting to integrate cyber tools into traditional operational military plans. The National Security Agency and U.S. Cyber Command have taken steps to improve the general level of cybersecurity. They have expanded beyond traditional roles to share information with the public.

Since technology is at the heart of the benefits and risks of cyberspace, technology is often viewed as a solution. Better encryption strengthens privacy, while better coding reduces vulnerabilities. Artificial intelligence has been identified as a means of improving cybersecurity, but also poses serious ethical issues that need to be further explored.

The head of U.S. Cyber Command is also the Director of the National Security Agency. Leading the largest number of people working on cyber issues for the government gives the commander a deep understanding of issues. Congress relies on this expertise. In 2019, the commander shared his view of the challenges with Congress.

Cyberspace is a contested environment where we are in constant contact with adversaries. The nation faces threats from a variety of malicious cyber actors, including non-state and criminal organizations, states, and their proxies. We see near-peer competitors conducting sustained campaigns below the level of armed conflict to erode American strength and gain strategic advantage.

~Gen. Paul M. Nakasone, U.S. Cyber Command



Deputy Assistant Secretary of Defense for Cyber Policy Participates in a Fireside Chat. Courtesy of the Department of Defense, Photo by Air Force Staff Sgt. Brittany Chase.

U.S. Cyber Command

Created in 2010, U.S. Cyber Command is the DoD command responsible for cyberspace operations. It is located at Fort George G. Meade, Maryland. The command includes military, intelligence, and information technology capabilities. Cyber Command has three main missions:

- Defend the Department of Defense Information Network (DoDIN).
- Provide support to other military commands for execution of their missions.
- Strengthen the country’s ability to withstand and respond to a cyberattack.

By law, Cyber Command is focused on activities that originate outside the country’s borders. It conducts defend forward operations to disrupt malicious cyber activity from its source. *Defend forward* means fighting malware on other countries’ networks. Cyberspace is global, so stopping a cyberattack in Poland can protect America’s networks. Many countries need help with their cyber defenses and U.S. Cyber Command helps America’s allies and partners.

With the president’s approval, and according to law, the DoD can support larger national efforts. At times, the DoD can help the FBI or CISA with cybersecurity inside America’s borders. This happened in 2020 to defend against foreign interference during the presidential election.

Cyber Command is a joint command supported by different military services. The service components are:

- **Fleet Cyber Command/Tenth Fleet (FLTCYBER)** is the Navy’s cyber force. It includes cryptologic intelligence, **signals intelligence**, information operations, cyberspace operations, electronic warfare, and space operations that support forces at sea and on shore.
- **Marine Corps Forces Cyberspace Command (MARFORCYBER)** advises U.S. Cyber Command’s use of Marine Corps cyber forces.
- **Army Cyber Command (ARCYBER)** conducts electronic warfare, information operations, and cyberspace operations.
- **Sixteenth Air Force (AFCYBER)** is the Air Force’s cyber force located in San Antonio, Texas. It includes intelligence, surveillance, and reconnaissance, as well as cyber warfare, electronic warfare, and information operations.

New Vocabulary

signals intelligence—
foreign intelligence
collected from
communications and
information systems



Watch Floor at U.S. Cyber Command. Courtesy of the Department of Defense, Photo by J.M. Eddins, Jr

National Security Agency

The National Security Agency (NSA) is a member of the U.S. intelligence community. It is responsible for signals intelligence (SIGINT). This type of intelligence comes from foreign communications and information systems. SIGINT is used to fight terrorism, support diplomatic negotiations, and support military operations.

The NSA plays an important role in cybersecurity. It can shed light on why an adversary conducts attacks, so that they can be stopped. The NSA also provides insights to industry partners to improve cybersecurity. The NSA can also issue guidelines to other federal departments to improve cybersecurity. Some key roles are:

- Providing intelligence warning of malicious cyber threats.
- Releasing assessments and ways to protect U.S. government systems.
- Offering cybersecurity advisories on public websites.
- Supporting defensive and offensive cyberspace operations.

Conclusion

The U.S. government is large, but it represents a very large country. The president is the leader of the federal government. The president takes an oath to protect the country from all enemies foreign and domestic. To do this in cyberspace, the president relies on CISA and the FBI for domestic issues. For foreign issues, the president relies on the Department of Defense and the intelligence community. Since cyberspace crosses borders, the national cyber director brings all the capabilities together.

Critical Thinking

New Vocabulary

discretionary spending
indictment
joint
prosecute
signals intelligence

1. The Department of Defense is responsible for defending America from foreign threats. This often happens outside the country's borders. Consider under what conditions DoD would assist the Department of Homeland Security. Also consider DoD's role when foreign threats originate from within the U.S.
2. Criminals and advisories exploit software vulnerabilities. Should the federal government require companies to meet certain standards? How might companies react? Should other countries do the same?
3. Congress plays an important role in national security. Creating the Cybersecurity and Infrastructure Security Agency and the National Cyber Director are two examples. If cybersecurity is everything security, think through the impact on overall responsibility for the country's defenses.

Study Guide Questions

1. What is a combatant command?
2. What Navy organization supports U.S. Cyber Command?
3. List three critical infrastructure sectors?
4. What role does the FBI play in cybersecurity?

5. What role does CISA play in cybersecurity?
6. What role does Cyber Command play in cybersecurity?
7. What role does the National Security Agency play in cybersecurity?

The Navy and Cyberspace Operations

What You Will Learn to Do

The country expects the Navy to deliver combat ready naval forces around the world. Global communications are necessary to connect forces based in the U.S. and those forces forward deployed. Distance and geography cannot matter. Like other large organizations, naval forces rely on computer networks for just about everything. Unlike most organizations, the Navy operates far from cellular towers and land-based telecommunications links. Deployed forces must bring their networks with them; satellites make this possible. Adversaries can make global communications difficult by interfering with navigation. They attempt to shut down computer networks through malware. They also attempt to deceive through information operations. Their actions illustrate that cyberspace is a contested area.

Skills and Knowledge You Will Gain Along the Way

- ✓ Understand the Navy's principal cyberspace organizations.
- ✓ Define the Navy's missions in cyberspace.
- ✓ Link the Navy's main cyberspace task forces to the Navy's missions in cyberspace.
- ✓ Identify the main ways the Navy operates in cyberspace.
- ✓ Appreciate the role the Navy Information Force plays in training Sailors for cyberspace operations.
- ✓ Link the Navy's cyberspace organizations to other Department of Defense organizations.



U.S. Fleet Cyber Command watch floor. Photo by Navy Petty Officer 1st Class Samuel Souvannason

U.S. Fleet Cyber Command/Tenth Fleet

Cyberspace is a contested space where adversaries seek advantage and counter U.S. actions. The Navy created U.S. Fleet Cyber Command, Tenth Fleet, while the Marine Corps has Marine Corps Cyber Forces Command. These commands provide the Navy and Marine Corps with access to its information networks. The commands also operate on the **electromagnetic spectrum**. This includes gamma, x-ray, ultraviolet, visible light, infrared, microwave, and radio waves. Electromagnetic transmissions are used to connect devices wirelessly for local and global communication and its allocation is managed by the federal government.

These Navy and Marine Corps commands have many capabilities. They collect signals intelligence. They conduct **cyberspace operations**. They connect the fleet through space-based capabilities. These capabilities are collectively known as *information warfare capabilities*, and they are all necessary for modern naval operations.

An example of **information warfare** is the spreading of propaganda or disinformation to demoralize or manipulate the enemy and the public. Therefore, information warfare includes career specialties of cyberspace, and intelligence. Enlisted and officers design and run networks. They ensure commanders have accurate information to be successful in peacetime and be prepared for war. They develop tools for defensive actions and offensive operations. The information warfare community is professional with its own schools and career paths. Information warfare qualified personnel can be found on ships, shore commands, and at national agencies. They are standing watch 24 hours a day, every day to bring the tools of the information age for sea power.

The Navy and Marine Corps train Sailors and Marines to secure the networks utilizing the three pillars of information security: confidentiality, integrity, and availability. The data must be confidential, preventing unauthorized users from seeing. The data must have integrity, meaning it is reliable and unchanged while it travels. The data must be available to authorized users at all times.

New Vocabulary

electromagnetic spectrum–

the range of wavelengths or frequencies of electromagnetic radiation

cyberspace operations–

the employment of cyberspace capabilities where the primary purpose is to achieve objectives in or through cyberspace

information warfare–

the manipulation of information trusted by a target without the target's awareness

Strategic Goals



Chief of Naval Operations and Commander, U.S. Fleet Cyber Command/U.S. 10th Fleet. Courtesy of DIVDS, Photo by Petty Officer 1st Class Samuel Souvannason

The U.S. Fleet Cyber Command (FCC) is at the center of all naval operations. Their strategic goals are:

- **Operating the network as a warfighting platform to defend and maneuver Navy networks, communication systems, and space systems.** Resilience is required to fight in a degraded way.
- **Conducting fleet-wide cryptologic warfare.** **Cryptology** has a deep history in supporting naval operations. This includes collecting signals intelligence, electronic warfare, cyberspace operations, electromagnetic maneuver warfare, signals security and operations, and information operations.
- **Delivering warfighting capabilities and effects through cyberspace.** The Navy now has a choice of missiles or malware to attack a target. Cyberspace operations provides an option to temporarily disable a target if the goal is to prevent loss of life that a missile could cause.
- **Accelerating the Navy's cyber forces to grow capabilities and capacity of Navy cyber teams.** Within a short time, traditional Navy fields have embraced their roles in cyberspace. Intelligence specialists have learned to assess adversarial cyber capabilities. Cryptologists have learned to defend networks and support operational plans.
- **Maintaining maritime superiority from the sea floor to space.** This includes working closely with U.S. Space Command. Satellites are the backbone for military communications. These personnel operate satellites and keep communications operational. Space-based assets are important for the U.S. to exercise sea power.

New Vocabulary

cryptology—
study of ways to secure
communications, usually
in secret form

Organization

Fleet Cyber Command is a three-star command of about 14,000 active and reserve Sailors. It is organized into active commands, Cyber Mission Force units, and reserve commands. FCC serves as the Navy component to U.S. Cyber Command, it serves as the Navy space component to U.S. Strategic Command, and it serves as the Navy's Services Cryptologic Component Command under the National Security Agency. With three hats, the command is very busy to make sure cyberspace is not threatened.

The FCC admiral also leads U.S. Tenth Fleet, which is the operational arm of Fleet Cyber Command. It executes its mission from the Maritime Operations Center (MOC) located at Fort Meade, Maryland. The National Security Agency is also at Fort Meade.

Tenth Fleet is one of the Navy's **numbered fleets**, but it is unique. While the other fleets are defined by geography (for example, Fifth Fleet encompasses Navy presence in the Middle East and Indian Ocean), Tenth Fleet is global in orientation. It is the Navy's only global MOC. Tenth Fleet directs and delivers desired tactical and operational effects in and through cyberspace, space, and the electromagnetic spectrum. These operations are executed through different task forces with the authority to accomplish specific tasks.

New Vocabulary

numbered fleets—*U.S. Navy fleets are numbered odd in the Pacific or West, and even in the Atlantic or East*

Missions

Fleet Cyber Command/Tenth Fleet executes information warfare. These capabilities ensure networks are reliable and that **command and control** is assured. Commanders must have the information necessary to maneuver forces and engage adversaries. And through electronic warfare and cyberspace operations, information warfare provides another way to engage an adversary through integrated **fires**. Underlying these missions are joint principles that define ways to operate in cyberspace. Operations must comply with the law of war and established rules of engagement. Just like it is unlawful to attack a hospital with a missile, it would be unlawful for malware to shut down the power to a hospital.



A Sailor sets up a satellite communications antenna. Courtesy of DVIDS, Photo by Petty Officer 1st Class Samuel Souvannason

New Vocabulary

command and control—*encompasses communications, people, and procedures that enable commander to direct forces*
fires—*attack capabilities of forces that includes use of cyberattack*

There are three basic categories of cyberspace operations:

- **Defensive cyberspace operations** are actions taken within cyberspace to defeat specific threats that breached or threatened to breach security measures. Cyberspace has made it easier for an adversary 8,000 miles away to attack the United States. Dozens of countries now have cyber military commands. Foreign intelligence services also target U.S. networks.
- **Cyberspace exploitation** are actions taken in cyberspace to gain or collect intelligence for future military operations. Exploiting cyberspace for intelligence purposes happened as communications shifted from telephones to computers.
- **Offensive cyberspace operations** are actions taken to project power in and through cyberspace. These are a form of fires that can have the effect of physical destruction caused by a missile. U.S. Cyber Command works with other U.S. military commands to develop these options. The authority to launch cyberspace attacks is tightly controlled by the White House.

Cyberspace attacks can create noticeable effects. Objectives of an attack include denial, manipulation, and countermeasures. In all cases, cyberspace operations should support larger objectives. When dealing with other nuclear weapon states, there is no need to demonstrate capabilities. When seeing a cyberspace attack, the first question to ask is, what do we expect to achieve?

Denial prevents an adversary's use of the target. This can happen by limiting its operations by slowing a network. You can also temporarily deny use of a network by overwhelming its servers or turning off the power. Or you might be able to destroy the target by causing systems to fail or erase all the servers with a wiper attack.

Manipulation through cyberspace operations can control or change information on an adversary's systems. This happens through deception, decoying, or spoofing techniques. An example is a radar screen that is blank even though planes are overhead. Another example could be showing three aircraft carriers offshore when there is really one or zero. Unless an adversary sends a plane to look, it is relying on a screen to know what is there.

Finally, *countermeasures* can be defensive. Every day, adversaries attempt to get on the Navy and Marine Corps networks. To prevent this from happening, Sailors and Marines defend the network by blocking malware and denying network access. Countermeasures can include an offensive cyberspace operation to stop the attack at its source.



Sailors on watch. Courtesy of DVIDS, Photo by Petty Officer 2nd class William Sykes

At sea, these capabilities are brought to bear through the information warfare commander (IWC). The IWC is an afloat position within a carrier strike group. The IWC is one of the warfare commanders like the strike warfare commander. The IWC has two main responsibilities. First, influence, disrupt, or undermine an adversary's decision-making abilities while protecting friendly forces. As described above, this can be done through manipulation or destruction. Second, analyze the information environment to support the other warfare commanders' objectives. There are three important areas the IWC supports:

- **battlespace awareness**
- supporting integrated fires
- assured command and control

New Vocabulary

battlespace awareness—

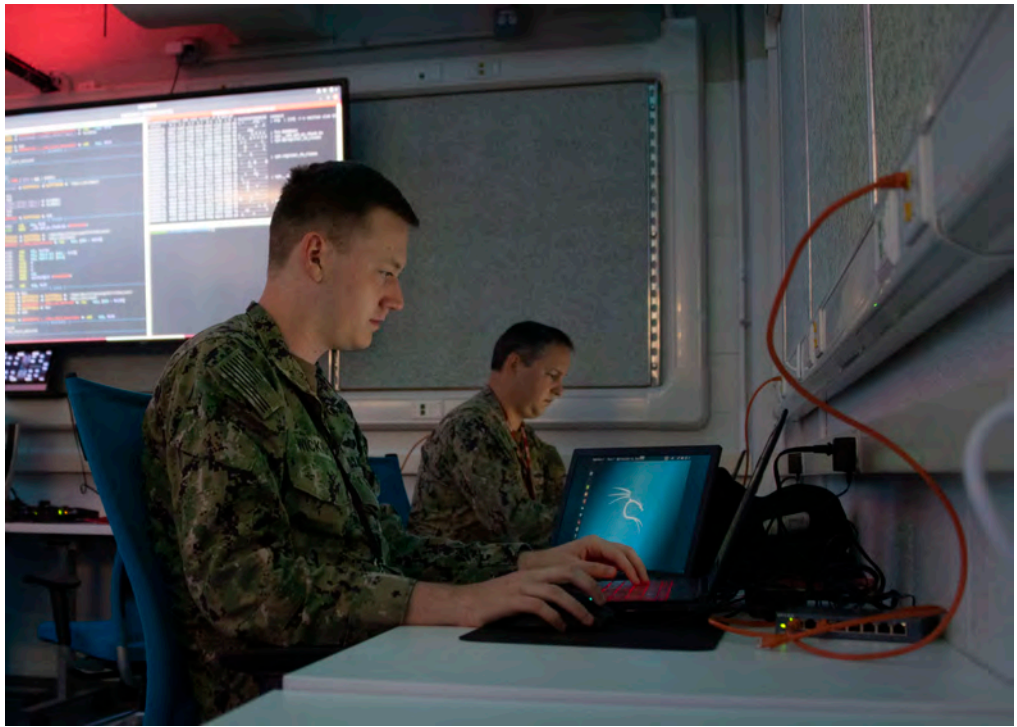
ability to understand the operational environment to inform national and military decision making



The commander awards the Information Warfare Qualification. Courtesy of DVIDS, Photo by Petty Officer 1st Class Samuel Souvannason

Training to Conduct Cyberspace Operations

Cyberspace is inherently a shared domain with little distinction between military and civilian. There is really just one network, and this leads to commonality with training. All Services start with a basic understanding of cyberspace as described in Chapter 1. Next, training focuses on developing software and hardware expertise. Finally, once Navy-trained personnel are assigned to mission force teams, additional on-the-job training is required to apply what is learned in school. This occurs in a real operational environment where adversaries are attempting to access U.S. networks.



Sailors engaged in a capture-the-flag challenge cyberspace exercise. Courtesy of DVIDS, Photo by Petty Officer 2nd Class William Sykes

The commander of the Naval Information Forces (NAVIFOR) is responsible for organizing, training, equipping, and certifying combat-ready information warfare forces. Reporting to U.S. Fleet Forces Command, NAVIFOR supports about 20,000 personnel. The primary enlisted ratings are cryptology (CT) and information systems technology (IT). The primary officer designators are cryptologic warfare (CW/181X), information professional (IP/182X), and cyber warfare engineer (CWE/184X). There are other ratings and designators included in the formation warfare community. The training programs for enlisted and officers vary in content and length, but there are common elements, such as:

- **Cryptology training** is based in mathematics and has a deep history in code breaking. The training focuses on the collection of foreign communications and non-communications known as signals intelligence. Additionally, it focuses on solutions to ensure the confidentiality, integrity, and authentication of national security telecommunications and information systems. Students learn to operate computer systems to conduct cyberspace operations, control, and safeguard systems access, provide signals intelligence, and support different military needs. Within cryptology, there are different specializations that include language, information operations, network target development, and maintaining sensors.
- **Information systems training** is focused on maintaining computer and telecommunication systems. Building computer literacy, network fundamentals, and managing databases are core training components. Students learn to design, install, and operate networks, function as a computer systems analyst, and train other personnel how to use systems. With a strong base in the technical aspects of computing, there is an information security dimension to the training. By monitoring, detecting, and reducing network intrusions, graduates assist with computer network defense.



Young Marines explore virtual reality. Courtesy of DVIDS, Photo by Lance Cpl. Kedrick Schumacher



A young Marine participates in Cyber Paths Summer Camp. Courtesy of DVIDS, Photo by Lance Cpl. Kedrick Schumacher

Satellites and Cyberspace Operations

Congress created the U.S. Space Force as a separate and distinct branch of the military in 2019. The Space Force grew out of existing Department of Defense capabilities. Space Force Guardians operate space systems such as satellites. They ensure all military branches can navigate, communicate, and conduct operations. At sea, naval forces rely on space-based satellites. The Navy has a small space force that works with the U.S. Space Force.



Navy's Mobile User Objective System Communications Satellite heads to orbit. Courtesy of DVIDS, Photo by Rick Naystatt

The Naval Information Warfare Systems Command (NAVWAR) focuses on buying systems for secure communications. It provides research and development, systems

New Vocabulary

geosynchronous—
*is an orbit approximately
22,000 miles above the
earth that matches the
earth's rotation*

engineering, and support to communication systems. This includes systems on ships and in space. There are two main efforts:

- **Consolidated Afloat Networks (CANES)** is the tactical afloat network. It promotes battlespace awareness through information sharing across ships and aircraft. It was also designed to defend against adversarial cyberattacks.
- **Mobile User Objective System (MUOS)** is a military satellite communication system. Since ships at sea cannot use cellular towers, MUOS uses a set of **geosynchronous** satellites to provide global coverage. By being in geosynchronous orbit, the satellites orbit at the same speed of the earth's rotation. This gives the effect of being fixed in space and always accessible from a certain part of the planet.

Conclusion

The Navy and Marine Corps rely on computers and networks for just about everything. Ships rely on space-based communication satellites for navigation and targeting weapon systems. Ashore, Marines rely on signals intelligence to understand an adversary's intentions and assist with finding adversary's forces. Then Tenth Fleet Command Vice Admiral T.J. White explained the importance of this. He said, "I am certain the opening rounds of a 21st century great power conflict, particularly one impacting the maritime domain, will be launched in the electromagnetic, space, or cyber domains. If the Navy is to fight and win, Navy networks must be able to survive those hits and 'fight hurt.'" With this in mind, information warfare is developing as a key warfighting area within the Navy and Marine Corps.

The Navy sees it fighting the network as a warfighting platform in cyberspace. Sailors and Marines will be in close contact with adversaries who try to gain access. With concepts of defensive and offensive cyberspace operations, Sailors and Marines train to run networks, exploit or disrupt adversarial networks, and provide U.S. commanders a warfighting advantage. Technical expertise is important, but it also includes the spirit of naval heroes like John Paul Jones. We remember his famous words in the face of calls to surrender, "I have not yet begun to fight."

Critical Thinking

1. Each military service has its own cyber component. Consider the reasons why. What are ways to ensure cooperation since an adversary's attack against one network is likely to impact other military networks.
2. Cyberspace is inherently a joint domain with little distinction between military and civilian. There is also little distinction on how the Services parse networks, manage networks, and train for defensive and offensive operations. Consider the merits of a Cyber Service and lessons from the creation of a separate Space Force.
3. Imagine a carrier strike group departing from Norfolk, Virginia. What are the cybersecurity requirements before it departs for ships and crew? When the ships leave territorial waters, what are the telecommunication requirements? How might its security posture change when it enters the South China Sea or the Arabian Gulf?

New Vocabulary

battlespace awareness
cryptology
command and control
cyberspace operations
electromagnetic
spectrum
fires
geosynchronous
information warfare
numbered fleets

Study Guide Questions

1. What are the three main ways the Navy conducts cyberspace operations?
2. What are the main task forces that support information warfare?
3. What are the three pillars of information security?
4. Why are satellites placed in geosynchronous orbit?
5. What are legal considerations when using military force?
6. What are ways the Navy conducts integrated fires through information warfare?
7. What are Navy Fleet Cyber Command's strategic objectives?

Careers in Cybersecurity

What You Will Learn to Do

Living in the information age underscores that basic computer skills are essential for just about every job. This is true if one works in a retail store where computers track inventories and enable payments. It is also true for Sailors serving on board guided missile destroyers that rely on computers for navigation and fighting. There is simply no exaggerating the importance of accurate information. This places cybersecurity at the forefront of everything we do. As the physical and virtual worlds continue to converge, the demand for careers in cybersecurity will grow.

Skills and Knowledge You Will Gain Along the Way

- ✓ Understand the education and training pathways to a career in cybersecurity.
- ✓ Appreciate the desired knowledge and skills needed for the cyber age.
- ✓ Identify the employment opportunities working for federal, state, tribal, and local governments.
- ✓ Identify the Navy enlisted and officer career fields in cybersecurity.
- ✓ Consider the importance of the private sector's role in developing cybersecurity skills.
- ✓ Recognize the roles non-profit organizations play in cybersecurity.
- ✓ Explain the importance of public-private partnerships to being successful in cybersecurity.



Citizen cyber. Courtesy of DVIDS, Photo by Joesph Eddins

Education Paths and Qualifications

The writer Lewis Carroll offered good advice in his book *Alice in Wonderland*: “If you don’t know where you are going, any road will get you there.” Guidance counselors love this quotation to remind students to plan for their futures. Military strategists also love it since their efforts start with a desired end-state or future they want.

Teachers, counselors, parents, and even friends can help you define your goals. Additionally, you can learn from others how to achieve your career goals. Watching interviews with those you consider successful can also help you learn how people you admire got where they did. Admirals today began their careers as ensigns if not midshipmen or sea cadets. Information technology pioneers invented technology in their garages and college dorm rooms. The military also provides a good place to start. The Navy provides training, resources, and experience for people to learn.

While the future is unknowable, one thing is certain; there is growing demand for employment in the information technology fields. The U.S. Bureau of Labor and Statistics forecasts that occupations in the cyber field will grow 13 percent by 2030, which is faster than the average of all other occupations. Salaries are growing too with a median annual wage of \$91,250 in May 2020, which is more than double for all other occupations. Education and training programs create ready paths or roads to achieve your goals to start a career in the cyber-technology field. When those roads do not exist, you can build them from existing programs.

Education Paths

Since the 1950s, the foundation for academic study of cyber technology is the field of computer science. Previously, those who studied computation primarily focused on mathematics. When electrical circuits were introduced, the field of physics became important to the study of computation. Since it was born from other disciplines, it is no surprise then that computer science has given rise to several specialized majors and fields that continue to evolve. These can be grouped as the application of math and physics to data computing problems. Other majors focus on designing and engineering computer systems. Finally, some majors focus on operating and securing networks and information technology systems. Below are some descriptions of four-year degree programs:

- **Computer Science** is the study and application of computational **algorithms** and information processing in computer systems. It provides a core foundation for designing software and hardware. Computer scientists work in important areas such as cybersecurity, artificial intelligence, machine learning, and robotics. Students develop skills to apply mathematics to computing problems and learn key programming languages in use today such as C++, Java, and Python. Students



Naval Academy graduation. Courtesy of DVIDS, Photo by Cpl. Lauren Whitney

New Vocabulary

algorithms—
instructions for problem solving

should have a passion for computers. They spend time working in labs on computers, routers, and other computer equipment.

- **Computer Engineering** combines essential elements of computer science and electrical engineering. It provides the foundation to learn about computing that includes the physics of electrical circuits to computer operating system designs. Students develop the abilities to create, integrate, and operate advanced computer systems.

Cybersecurity as a discrete major provides a foundation in computer architecture, programming, networks, information assurance, and forensics. Students also combine the technical aspects of computer science with other areas such as law, ethics, and government.

Students who graduate with a bachelor's degree in computer science or a related field have many opportunities to work for large multi-national corporations. Some examples are Cisco, Microsoft, and Oracle. These companies also hire students without computer science degrees who can work in finance, marketing, or consulting.

Training Paths

A bachelor's degree in computer science is a sure-fire way to work for a major information technology company. However, many corporate founders actually did not finish college. Bill Gates, who founded Microsoft, did not finish Harvard; neither did Mark Zuckerberg, who founded Facebook. Steve Jobs, who founded Apple, did not finish Reed College. Of course, other founders did finish college, such as Jeff Bezos, who founded Amazon. Bezos was a high school valedictorian and graduated from Princeton with degrees in electrical engineering and computer science.

College certainly offers a path to success. In addition to college, there are many paths or certifications to start one's career in cyber technology. Certain companies' products dominate the field, such as Oracle, Google, and Microsoft. It is quite possible to become an expert on maintaining cloud computing databases, installing hardware, or supporting forensic investigations of cyber intrusions through proprietary training programs. These training certification programs are good for both those entering the workforce and those who need the latest on the ever-changing cyber field. A few of the training certification programs are:

- **Oracle University**, which offers entry-level training courses to begin your career. Since Oracle is one of the world's largest software companies, individuals will gain expertise in some of the most used products to gain certifications in data science, machine learning, database management, and cloud computing.
- **Google**, which has an online training program to certify individuals in cloud computing skills. These skill would market well to organizations that use Google products, services, and tools. There are also options for those who seek a path to professional certifications as a data engineer, cloud security engineer, and cloud developer.
- **Microsoft Learn**, which provides students with self-paced courses to enable web development and to learn the programming language Python. These professional certifications can be used to gain positions in cybersecurity, engineering support, and supply chain management.

Qualifications

Cybersecurity is a field that often requires clear and measurable credentials. For example, no college degree is required to work at Fleet Forces Command as an IT network specialist. However, applicants must have experience installing, configuring, testing, operating, and managing networks and their firewalls. An operations analyst position at the cybersecurity firm Mandiant does not require a college degree.

However, applicants should have two years' experience with Microsoft Office products and Oracle Cloud.

While job qualifications change, there is no substitution for having a deep interest in computers and software. Intellectual curiosity with an ability to solve new problems is a must. Some key cyber qualifications to show mastery of skills include:

- **CompTIA IT Fundamentals** focuses on the basics of computing, information technology infrastructure, software development, and database use. Developed by the non-profit trade association—Computing Technology Industry Association—this certification can be enough for an entry-level IT position and the basis for more advanced courses.
- **Certified Ethical Hacker** provides a short course, knowledge test, and certification illustrating one knows how to hack. Premised on the idea that good defense starts with knowing how the offense thinks and behaves, the course teaches skills in information security, attack detection, attack prevention, and mitigation procedures. While hacking is illegal in the U.S., companies, and government agencies host hack-a-thon's granting participants the authority to find network vulnerabilities to improve network defense.
- **Certified Information Security Manager** provides a course and certification for those with technical experience and provides the training to assume a leadership role in a cybersecurity organization. Topics include information security governance, information risk management and compliance, information security program development and management, and information security incident management.

Public Sector and Military Opportunities



The Pentagon. Courtesy of DVIDS, Photo by Sgt. 1st Class Marisol Walker

The U.S. economy is a regulated capitalist system where individuals are free to create businesses and corporations can grow. Consequently, the cyber technology landscape is largely one dominated by multinational corporations. In addition, there are many opportunities to work on cyber issues in the **public sector**.

Since at least the 1990s, the military has also been a place to gain experience. The military provides all the training and the work to develop expertise. Employer's value the experience of working on operational challenges in cyberspace. Intelligence

New Vocabulary

public sector—
the governmental parts of
society at the federal,
state, tribal, and local
levels

agencies, such as the National Security Agency, employ large numbers of mathematicians and computer scientists. Intelligence processing requires algorithms to sift through the vast amount of data collected.



Note

The military provides cyber training and entry-level jobs in technology fields.

New Vocabulary

private sector—
the non-governmental parts of society and the economy; for example, corporations and non-profits

Public Sector

As discussed in Chapter 1, the government played an important role in the development of the internet. While **private sector** research and development is greater than public sector funding, government plays critical roles in regulation and cybersecurity. At the national level, just about every department, commission, and agency plays a role in cybersecurity. The Federal Communications Commission (FCC) regulates how electronic devices operate. The Federal Aviation Administration (FAA) regulates where space-based internet satellites can orbit. And the Department of Transportation (DoT) regulates pipeline security.

Certain organizations do play a large role in cybersecurity. These organizations cut across three federal departments: Homeland Security, Department of Justice, and Department of Defense:

- **Cybersecurity and Infrastructure Security Agency (CISA) is a part of the Department of Homeland Security (DHS).** CISA is the operational lead for federal-level cybersecurity within the dot-gov domain. CISA leads the national effort to understand, manage, and reduce risk to cyber and physical infrastructure. It plays an important role coordinating cybersecurity activities across the federal government and with the private sector. Working with the intelligence community, CISA also releases threat vulnerability assessments. Finally, CISA works with the private sector to develop ways to improve cybersecurity.
- **Federal Bureau of Investigation (FBI) is part of the Department of Justice (DOJ).** The FBI is the lead federal agency for investigating cyberattacks and intrusions. Federal agents work with victims to identify those responsible for malicious cyber activities. The FBI has trained cyber squads in each of the 56 field offices around the country. Additionally, the FBI maintains the Internet Crime Complaint Center to collect reports of cybercrime. The Department of Justice uses FBI reports to prosecute in the court system. The FBI also works with foreign governments to arrest hackers in other countries.
- **U.S. Cyber Command (CYBERCOM) is part of the Department of Defense.** It reports directly to the Secretary of Defense. While led by a four-star general or flag officer, both civilians and uniformed personnel work at Cyber Command. Uniformed personnel come from all the military service branches. The specific Navy enlisted **rating** and officer designators are explored below. Civilians work in areas such as cyberspace policy, information technology, and exercise plans. Internships are also available at Cyber Command. An internship is a great way to gain insight into cyber issues.

All federal civilian job openings are advertised on the internet at USAJobs.gov. It is a great place to see where the jobs are and what skills are required.

New Vocabulary

rating—
an enlisted career specialty in the Navy



High school students compete in CyberPatriot. Courtesy of DVIDS, Photo by Candy C. Knight

While many opportunities are available during college or after graduation, there are also programs to prepare young adults for careers in cybersecurity. One program is CyberPatriot, which offers cyber camps and self-paced online courses to learn more about cybersecurity, and it hosts the largest cyber defense competition. The competition puts teams of high school and middle school students in role-play scenarios. They must identify and fix problems while maintaining the organization's computer services. The top teams earn free trips to the final competition in Maryland.

Military Opportunities

The Navy has always valued technology and the personnel who can operate advanced equipment. This was true when the age of sail gave way to steam and steam production shifted from coal-fired boilers to gas turbine engines and nuclear reactors. The same is true in the information technology space where the Navy builds and operates its networks and infrastructure on land, under the sea, and in space. Sailors maintain and operate this equipment to ensure the Navy can conduct operations.

The Navy men and women who work directly in the cyber-technology fields are included in the Information Warfare Community (IWC). There are many enlisted ratings and various officer career fields in the IWC. In general, all IWC personnel have access to the Navy's most sensitive technologies and classified material, requiring them to maintain security clearances. Additionally, they tend to work together at sea and onshore to integrate all aspects of information warfare. The Navy also created its own schools to train personnel in fundamentals related to information warfare. While the Navy uses Microsoft products, Sailors learn to maintain these products on secure government systems. They also ensure systems are optimized for the Navy's missions.



Defense Department information networks. Courtesy of the Department of Defense

Enlisted advancement opportunities and career progression are linked to the needs of the Navy. This is determined by annual defense budgets and current staffing levels. Enlisted are expected to be experts in their career specialty, such as cryptology and information systems technology. Advancement to the next pay grade (through E-6) is determined through knowledge-based tests to ensure Sailors are experts in their

fields. Advancement to E-7 and above is determined by experience and the ability to lead others at places like U.S. Fleet Cyber Command.



U.S. Navy Fleet Cyber Command. Courtesy of DVIDS, Photo by Petty Officer 2nd Class William Sykes

For officers, promotion to lieutenant is time-based. For example, an ensign will be promoted to lieutenant junior grade LT (jg) after two years. Officers in the information warfare community are required to complete the basic personnel qualification standard (PQS) for their designator within three years of commissioning. As officers increase in rank, promotion is based on the ability to lead people and manage resources.

Private Sector and Non-Profit Opportunities

If you look at your devices, you will see how prominent the private sector is in cyber technology. Your computer, tablet, or phone was made by a corporation. The software was developed by a corporation. Your connection to the internet is made through a telecommunications corporation. These companies are all part of the private sector.

There is also many non-profit organizations that work on cyber technology issues. This ranges from organizations focused on internet governance to promoting privacy online. Additionally, there are think tanks that conduct studies to inform public policy and promote cyber literacy across society.



Note

The private sector is part of the economy largely free of government control.

Private Sector

There is no shortage of opportunities to work in the private sector, and demand continues to grow. As learned during the COVID-19 pandemic, society relies on technology for just about everything. You can work for software or hardware companies, or you can also work for companies not viewed as tech related. Just about every business has the need for technological support. These companies hire directly to maintain websites, schedule deliveries, or pay employees.

Responsibilities can include:

- Analyzing, designing, and debugging software programs.
- Articulating technical characteristics of needed services for development teams to meet the demands of users.
- Designing and implementing network communications and solutions.
- Investigating data breaches and aiding an organization's recovery after a malware attack.

In addition to the technical opportunities, there are important roles for liberal arts and business majors to play.

Responsibilities can include:

- Communicating requirements across all levels of product development.
- Working directly with customers to drive product sales and negotiate pricing and contractual agreements.
- Delivering classroom training to customers and supporting integration of software solutions.

Non-Profit Opportunities

Schools, churches, public interest groups, and trade associations are all non-profits. One can work with supporting communities to improve cybersecurity at the individual or the group level.

Responsibilities can include:

- Identifying cyber bullying and reporting to responsible authorities.
- Training organizations to keep sensitive, personally identifiable information secure.
- Implementing cybersecurity best practices.

There are also opportunities to work for non-profits engaged in cyber policy. Notable organizations work on internet governance issues, such as file compatibility standards, promote ethics for artificial intelligence, and promote human rights in cyberspace. There are many examples of these types of organizations, but here are a few:

- [The Internet Society](#) was founded in 1992 by several Internet pioneers and has chapters all around the world. They had a simple goal that the internet should be for everyone. It seeks to reduce the digital divide between those who have access and those who do not. Membership is open to all. The Internet Society provides a place to share information to make the internet better.
- [The Internet Engineering Task Force](#) is a self-organized group of people to solve the internet's engineering problems. There is no membership list, and anyone may sign up to be on the mailing list and contribute. However, technical understanding is needed.
- [Electronic Frontier Foundation](#) is a non-profit focused on digital privacy, free speech, and innovation. The organization addresses how technology affects democratic society and ways to improve protection for individuals through better public policy. Its mission is "to ensure that technology supports freedom, justice, and innovation for all people of the world." Staff technologists work on software projects to enhance privacy and security online. They employ interns and volunteers.

Protecting Privacy Online

Civil liberties are listed in the Bill of Rights to the U.S. Constitution, providing fundamental freedoms and protections from government. There are adequate oversight measures to prevent the abuse of civil liberties online by the government. However, when users agree to use software, they often give up those rights of privacy to companies. Organizations like the Electronic Frontier Foundation work with the legal system to extend those rights. A list of significant cases and their implications is located at www.eff.org/legal-victories.

Conclusion

The U.S. is a leading country in the information age. Major technological centers are in Silicon Valley, California; Cambridge, Massachusetts; and Research Park Triangle, North Carolina. Learning a programming language can be scary, but there are many colleges and technical schools to prepare you. If you like computers and puzzles, go online and start to learn how your devices work.

After high school, the Navy is another way to develop technical expertise. The Navy will train you to set up networks, decode messages, and promote cybersecurity. The Navy also provides work experience valued by the public sector, private sector, and non-profits. You don't have to necessarily become a computer scientist. Success can come with intellectual curiosity and strong problem-solving skills.

Critical Thinking

1. There are many types of jobs that fall under different sectors (public, private, non-profit). Choose a sector and explore three different jobs in that sector. How might you learn more about that work and if it is something you would possibly enjoy?
2. Research the qualification to be commissioned as a cryptologic warfare (CW) officer. List the Navy's training requirements and discuss the types of at-sea and on-shore rotations a CW officer would fill.
3. Identify a living leader in a cybersecurity company or other organization. Assess how they achieved their credentials and compare that to the qualifications for job openings at their company.
4. Within your state, identify state-run cybersecurity organizations. Consider how the state government works with local governments and the private sector to offer cybersecurity services.

Study Guide Questions

1. What are the Navy enlisted ratings in the Information Warfare Community?
2. What are the Navy officer career fields in the Information Warfare Community?
3. What are the principal differences between computer science and computer engineering?
4. What are the various ways to achieve cybersecurity credentials?
5. How does the private sector enhance cybersecurity?

New Vocabulary

algorithm
private sector
public sector
rating

Unit 5

Space Exploration

For as long as humans have been walking the Earth, they've also been looking up at the stars in wonder. It is only within the last 70 years that we've had the technology to reach up above the atmosphere and begin to explore the universe. This unit will give you a historical overview of American efforts to send astronauts into Earth's orbit, to the surface of the Moon, and, in the future, onward to explore and colonize Mars. This unit will show you how the U.S. Navy has played a tremendous role in human spaceflight. You'll get a basic understanding of the dangers of space weapons, as well as efforts to safeguard our assets in orbit above us. This unit will give you a glimpse into the perils the universe has in store for us and into our efforts to search for other habitable planets and life beyond our home planet. There is no larger playground on which to explore than the whole of the universe. And if you are so inspired, the career paths within the government and commercial space industries are endless.

Chapter 1

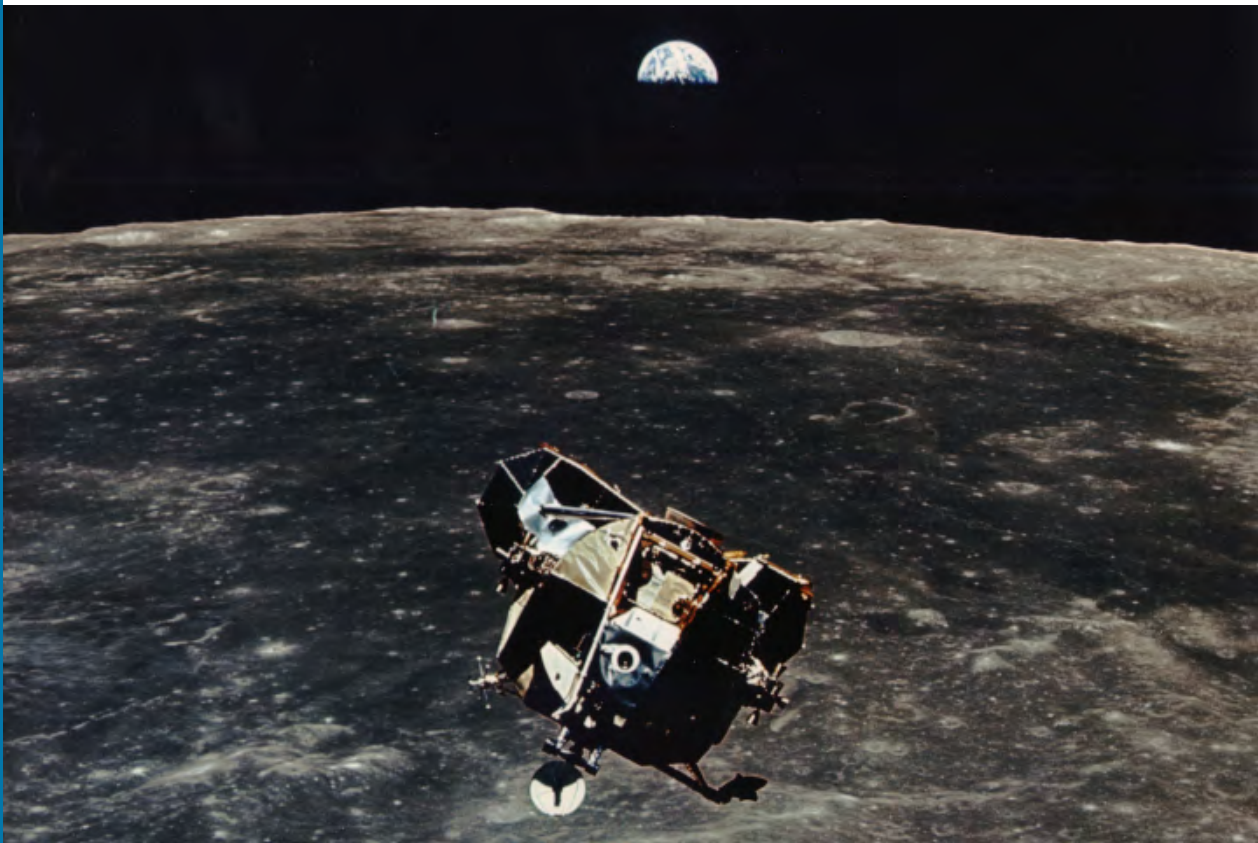
From Sea to Space

What You Will Learn to Do

The United States Navy and the National Aeronautics and Space Administration (NASA) have had a working relationship for more than 60 years. Even into the 2020s they continue to complement each other in many different aspects of space exploration. You will learn about U.S. Navy officers who made historical achievements in the American space program, as well as other functions the Navy provides to support the space program here on Earth.

Skills and Knowledge You Will Gain Along the Way

- ✓ Learn about Navy personnel who were key to the space program and their firsts in space.
- ✓ Understand how Navy personnel support the space program here on Earth.



An Eagle takes off for home. Courtesy of NASA

Navy Firsts In Space

The relationship between the U.S. Navy and NASA was forged back in the late 1950s when NASA first began to look for pilots to become astronauts. These astronauts would eventually fly aboard NASA's new Mercury spacecraft and in many of the spacecraft that followed. These astronauts were courageous pioneers that were willing to put their life on the line for the space program.

Alan Shepard

Alan Shepard was selected in the first class of Mercury astronauts and became the first American to go into space on May 5, 1961. Inside the Freedom 7 spacecraft, he was launched into space by a Redstone rocket on a **suborbital flight**. His quick 15-minute flight reached an altitude of 116 miles and he landed 302 miles down the Atlantic Missile Range. This was a tremendous accomplishment.

An inner ear problem temporarily halted his flying. Following an operation on his ear, Shepard went on to become the fifth American to walk on the moon as Commander of Apollo 14. He spent a total of 9 hours and 17 minutes exploring the lunar surface, and even hit a couple of golf balls on the moon.

Before he became an astronaut, Shepard attended the U.S. Naval Academy and served in World War II aboard the destroyer USS *Cogswell*. After the war, he attended flight training school and became a test pilot of many different aircraft, logging more than 8,000 hours of flying time.



Astronaut Alan B. Shepard was the first American to reach outer space. Courtesy of NASA

New Vocabulary

suborbital flight—
when a spacecraft
reaches outer space but
does not complete one
revolution around Earth

Neil Armstrong



Neil Armstrong standing next to an experimental aircraft. Courtesy of NASA

Neil Armstrong, famously, the first man to walk on the surface of the moon, as a member of the Apollo 11 mission, on July 20, 1969. That, however, would not have been possible had he not been the first to land a spacecraft on the surface of the moon. The landing turned out to be more of a challenge than anyone had anticipated. The initial area was very rocky, so Armstrong maneuvered the craft some 1,100 feet to the west before finding a suitable landing spot. They were close to running out of fuel and having to abort the attempt. Armstrong and Lunar Module pilot Buzz Aldrin spent about two and a half hours

walking on the lunar surface, collecting samples, setting up experiments, and cementing their place in history.

Earlier, in 1966, Armstrong commanded the Gemini VIII mission. He and co-pilot Dave Scott performed **rendezvous** and docking tests with the Gemini Agena Target Vehicle (GATV). Soon after docking, the two spacecraft began to roll. After several attempts to stop the roll failed, Armstrong undocked from the GATV. This, however, only sped up their rotation. In a final attempt to stabilize their tumbling spacecraft, the crew managed to shut down several systems. Their efforts were finally successful to stop the roll.

Before he was an astronaut, Armstrong was fascinated with airplanes and learned to fly at the age of 15, before he could even drive a car. He flew 78 combat missions as a Navy pilot in the Korean conflict. He also served as a test pilot and engineer for the National Advisory Committee for Aeronautics (NACA), which later became NASA.

New Vocabulary

rendezvous—
*when two spacecraft
approach to a very close
distance*

Pete Conrad, Alan Bean, and Dick Gordon

Apollo 12, the second human landing on the surface of the moon, had an all-Navy-pilot crew. Commander Charles “Pete” Conrad Jr., fellow moon walker, Alan Bean, and Richard Gordon were a very close crew and were friends before and after their mission. Fifty-two seconds after launch on November 14, 1969, the rocket was struck by lightning, not once, but twice. This caused all three fuel cells, which provide power to the spacecraft, to go offline. The crew was able to regain power and continue with their mission.

Unlike the first landing of Apollo 11—which touched down more than four miles from the intended landing site—Apollo 12 aimed to make a precise landing. Conrad piloted the Lunar Module to 500 feet from its targeted landing site, near the Surveyor III. One of their tasks was to retrieve the Surveyor III, a robotic lander which had been there for more than two and a half years. Conrad and Bean made two spacewalks, spending over seven hours on the lunar surface.



The crew of Apollo 12 consisted of (from left) Pete Conrad Jr., Richard Gordon Jr., and Alan Bean. Courtesy of NASA

John Young and Bob Crippen

On April 12, 1981, John Young and Bob Crippen, an all-Navy crew, flew the first crewed mission of NASA's next-generation spacecraft, the **space shuttle**. Space shuttle Columbia was the first crewed spacecraft that launched with **Solid Rocket Boosters (SRBs)** and returned to earth landing like a plane, rather than splashing down in the ocean.

John Young was a veteran of four spaceflights prior to commanding the maiden space shuttle mission. The first was Gemini 3, where he operated the first computer ever used on a crewed spacecraft. As Command Module Pilot of Apollo 10, Young flew to the moon where he, Tom Stafford, and Gene Cernan would test the entire Apollo landing process without actually landing. As Commander for Apollo 16, Young, along with Charlie Duke and Ken Mattingly, went to the moon on the fifth mission to successfully land on the surface. Young and Duke would spend almost three full days on the moon.

Crippen later commanded the space shuttle flight that carried the first American female astronaut, Sally Ride, into space.



Commander John Young (left) and Pilot Robert Crippen prepare for the maiden voyage of the space shuttle program. Courtesy of NASA

New Vocabulary

space shuttle—
NASA's partially reusable spacecraft that launched like a rocket but returned to Earth as a glider
Solid Rocket Boosters (SRBs)—
solid-propellant rockets used to provide the Space Shuttle enough thrust to escape the Earth's gravitational pull

William Shepherd



Bill Shepherd (left) was part of the first crew to live and work aboard the ISS. Courtesy of NASA

William “Bill” Shepherd was selected as an astronaut in 1984 and went on to fly three space shuttle missions. Unlike many Navy astronauts, he was not a pilot; however, he did attend the U.S. Naval Academy.

His first space shuttle mission was the shuttle Atlantis in 1988, during which he was to release the Onyx satellite into orbit. However, upon release, one of the antenna dishes failed to deploy. The crew retrieved and repaired the satellite before releasing it once again.

On his next mission, he deployed the European Space Agency’s Ulysses spacecraft, which was being sent on a mission to the sun to explore its polar regions. The mission was a success. Ulysses made it to the sun and spent 18 years orbiting our star carrying out its studies. His last space shuttle mission, in 1992, featured the deployment of the Laser Geodynamic Satellite, also known as LAGEOS-II.

That, however, was not the end of Captain Shepherd’s career as an astronaut. In 2000, Captain Shepherd flew aboard a Russian Soyuz spacecraft and docked to the new **International Space Station**. He and two Russian **cosmonauts** spent almost six months as the space station’s first crew. They were responsible for getting everything working inside and preparing the station for future crews and expansion of the outpost. Captain Shepherd retired from NASA in 2002, but you can go outside and see his work still flying overhead today.

Scott Kelly



NASA astronaut Scott Kelly spent 340 days living aboard the ISS. Courtesy of NASA

Scott Kelly and Russian cosmonaut Mikhail “Misha” Kornienko spent 340 days living aboard the International Space Station from 2015-2016. The goal of this year-long mission was to better understand the side effects of **microgravity** and evaluate the challenges astronauts will face on long-duration space missions. Kelly’s time aboard the ISS provided even more valuable data than normal, as NASA simultaneously studied Mark Kelly, Scott’s identical twin brother.

For Scott Kelly, a Navy aviator, the flight to the ISS was his fourth spaceflight. One of which he was the Pilot on space shuttle Discovery, on what was the third Hubble Space Telescope servicing mission.

New Vocabulary

International Space Station (ISS)– space station built and supported by 15 nations in an ongoing cooperative effort to study a number of scientific fields
cosmonauts– Soviet or Russian astronauts

New Vocabulary

microgravity– a condition of very low gravity where weightlessness results

Navy Astronauts Still Leading the Way

New Vocabulary

Crew Dragon—*a partially reusable spacecraft developed and manufactured by American company SpaceX.*

In 2020, NASA astronauts resumed flying to the International Space Station from U.S. soil once again. This time aboard a new ride—the SpaceX Falcon 9 rocket and **Crew Dragon** spacecraft. With many of the space shuttle astronauts now retired, NASA needed new astronauts for missions to the space station and for the upcoming Artemis program, which will return astronauts to the surface of the moon. Navy personnel once again are among the new generation of astronauts.

As part of the Crew-1 mission, Victor Glover became the first astronaut with a Navy background to fly aboard the newly certified spacecraft. The Crew Dragon capsule was launched atop a SpaceX Falcon 9 rocket and took astronauts to the ISS for a six-month stay. Glover is the first African-American astronaut to serve as a crew member on a full ISS rotation mission. Serving as Flight Engineer, he completed four spacewalks in support of solar array upgrades for the space station, and performed experiments and Earth observation tasks.



Victor Glover prepares tethers for his first spacewalk while serving aboard the ISS. Courtesy of NASA

Six months later, Navy Lieutenant Commander Kayla Barron was part of the Crew-3 mission. Less than 24-hours after launch, the spacecraft docked with the ISS. She spent six months aboard the ISS where she performed space station maintenance tasks and conducted science experiments. Barron's Naval experience includes being deployed on the USS *Maine*, an Ohio-class ballistic missile submarine, where she qualified as a submarine warfare officer. She is one of the first women to serve on a submarine. She is now involved in the development of NASA's Artemis program.



Kayla Barron “juggles” Christmas presents aboard the ISS on Dec. 20, 2021. Courtesy of NASA

Glover and Barron are among a new generation of Navy service members working for NASA today. They could very well be among a select group of astronauts to leave their bootprints on the moon in coming years.

Astronaut Training

In the early days of human spaceflight, NASA almost exclusively recruited pilots to become astronauts. Pilots were already trained to fly and survive in a harsh environment. Whether an astronaut is launching on a rocket or flying in an aircraft, a mechanical failure could land them in a very remote part of the world, so survival training is a must. One part of the astronaut candidates' training is known as wilderness survival training. It takes place at the Navy's 12,500-acre wilderness facility at Brunswick Naval Air Station where they learn land survival, navigation, and field medicine.

With the advent of the space shuttle—and later, the International Space Station—NASA needed more-specialized astronauts, known as Mission Specialists. Mission Specialists perform tasks such as repairing satellites, servicing the ISS, and performing experiments. NASA has turned to civilians and non-pilot military personnel to fill some of these new positions. Since these new astronauts do not come from a pilot background, they require similar flight and survival training to what their pilot counterparts had. The Naval Air Station at Pensacola, Florida, has been providing training for astronaut candidates (often referred to as ASCANS) for many years. The candidates receive water survival training, aviation physiology, and flight training.

Spaceship Recovery

While the Navy's role in providing astronauts is one to be proud of, the military branch also offers many other services that NASA requires. For instance, up until the space shuttle, all returning U.S. spacecraft landed in the ocean. The Navy provided ships, planes, helicopters, and personnel to retrieve the returning astronauts and their spacecraft from the ocean. These retrievals are not an easy task. The capsule bobs around in the ocean, sometimes in rough seas, and divers and other Navy personnel put themselves at considerable risk.



Navy divers recover NASA's Orion Crew Module after spacecraft's first test flight in 2014. Courtesy of NASA

One of the more recognizable recovery ships, the USS *Hornet* is now a floating museum in Alameda, California, that anyone can visit. The *Hornet* recovered both Apollo 11 and Apollo 12, so you can see where the first men to walk on the moon were welcomed back to Earth. In all, the Navy recovered five Mercury capsules, 10 Gemini spacecraft, 11 Apollo spacecraft, and their astronauts and crew from the ocean. They also retrieved Ham the monkey and his capsule, as well as numerous uncrewed test capsules.

The Navy will resume its retrieval role with the Orion capsule. This time, however, instead of helicoptering the capsule back to the ship, the Navy will be using new procedures. They hope to accomplish the entire process from splashdown to extraction in two hours or less.

Conclusion

From being the first American in space to the first man to walk on the moon, the Navy has contributed to many historical achievements in the American space program. The Navy provides personnel with the skills to not only fly in space but perform tasks to support the program back on Earth. Navy personnel have been an integral part of the program from the start until today.

Critical Thinking

1. Even with knowing all the potential dangers, would you still consider becoming an astronaut?
2. Would it be difficult for you to be on the International Space Station for a year away from your family and friends? Or would you find it an exciting adventure?
3. Navy personnel played and continue to play key roles in the space program. What are some of those key roles?

Study Guide Questions

1. How has the Navy provided support to the Space Program?
2. What skills have been beneficial to Naval personnel who have advanced to the Space Program?
3. What does it mean for a spaceship to rendezvous?
4. Who was the first American to go into space?
5. Who was the first American female astronaut?
6. How many miles away from the lift-off point did Alan Shepard land?

New Vocabulary

cosmonaut
Crew Dragon
International Space Station (ISS)
microgravity
rendezvous
Solid Rocket Boosters (SRBs)
space shuttle
suborbital flight

Chapter 2

Learning to Fly

What You Will Learn to Do

Humans have wanted to fly for millennia, but the age of powered flight did not arrive until the beginning of the 20th century. The Wright Brother's first airplane flew nearly 900 feet in 1903. Only 23 years later, the invention of liquid-fuel rocketry ignited humanity's ultimate quest of flying away from the Earth. In less than half a century, spacecraft carried astronauts 850 miles into space at a speed of nearly 18,000 mph. Reality caught up with thousands of years of dreaming in roughly half a century.

Skills and Knowledge You Will Gain Along the Way

- ✓ Understand how rockets were invented and first used.
- ✓ Learn how liquid propellants transformed weaponry into space launch vehicles.
- ✓ Consider why the quest for spaceflight was pursued so rapidly.
- ✓ Appreciate how the space barrier was broken.



The Wright brothers are aviation pioneers credited with inventing, building, and flying the first successful airplane. Courtesy of History Collection

Rocketry Leads to Space Travel

Rocketry dates back to the ninth century A.D., following the invention of gunpowder in China. At first, gunpowder was just used in fireworks. Over time, better formulations of gunpowder and an array of self-propelled weapons were developed throughout Asia and Europe. Rockets became more sophisticated in the 17th century due to the scientific principles by Isaac Newton. His first law of motion asserted that once set in motion, an object will continue in motion until it is opposed by some outside force. This implied a rocket would continue flying after its fuel ran out.

Early in the 20th century, the vision of human spaceflight took hold in several countries. Russian Konstantin Tsiolkovsky, German Hermann Oberth, and American Robert Goddard independently recognized the need to design a rocket that used liquid fuel, as it would be a more efficient propellant than solid fuel. Liquid fuel would also allow the control of speed, even being stopped and restarted.



Dr. Robert Goddard poses with his first liquid-fueled rocket. Courtesy of NASA

Robert Goddard launched the world's first liquid-fuel rocket in 1926. The skeletal rocket traveled for 2.5 seconds, reaching a speed of 60 mph and an altitude of 41 feet, before landing 184 feet from its launch tower. Over the next 20 years he improved rocket engines, fuel pumps, and aerodynamics. He developed a **gyroscope** flight stabilization system and built an engine with four combustion chambers.

During World War II, the German military developed several types of rockets, but the V-2 was the largest and most powerful. In its final form, the V-2 was 46 ft long, 65 in. in diameter, and could deliver a 2,200 lb warhead. It was used during a seven-month campaign against England in 1944. Near the end of the war, Werner von Braun recognized that Germany was going to be defeated. So he and his V-2 development team surrendered to the Americans, rather than risk being killed by the German SS or captured by the Russian Army. The Americans took possession of the V-2 designs, components, and testing documents before the Russian Army arrived. In December 1945, von Braun and more than 100 of his team members went on to help the United States develop rockets and test them at White Sands Proving Ground in New Mexico.

Aiming for Space

Wartime advances in airplane technology led to the desire to fly faster, higher, and longer. The National Advisory Committee for Aeronautics (NACA), created in 1915, cooperated with the Air Force and Bell Aircraft, to achieve **supersonic flight**. In 1947, Captain Charles "Chuck" Yeager piloted the X-1 air-launched, rocket-powered plane through the sound barrier (Mach 1). NACA also worked with the U.S. Navy and Douglas Aircraft to develop the D-558-2 Skyrocket. In 1953, it reached Mach 2 (twice the speed of sound) in a flight piloted by Scott Crossfield.

New Vocabulary

gyroscope—
device containing a
rapidly spinning wheel
that maintains an object's
desired orientation

New Vocabulary

supersonic flight –
passage through the air
at speed greater than the
velocity of sound

New Vocabulary

ballistic missile—
rocket-powered object
that after engine
shutdown continues on
an unpowered, parabolic-
like trajectory



The X-15 hypersonic research aircraft was instrumental in the development of the human spaceflight programs that followed. Courtesy of NASA

NACA focused on manned and unmanned flight at speeds of Mach 4–10 and altitudes of 12–50 miles. Higher speeds and altitudes suggested the ability to launch an unmanned satellite into orbit. In 1958, NACA was absorbed into a new agency, the National Aeronautics and Space Administration (NASA). Faster and higher flight meant more advanced aircraft. This led to the X-15 air-launched rocket plane, a joint project of NASA, the Air Force, and North American Aviation. By 1966, the X-15 had flown above Mach 4 for a total of nearly five hours, including 12 seconds above Mach 6.

The other way of experimenting with higher, faster flight was with intercontinental **ballistic missiles** (ICBMs). Originally designed in the mid-1950s to deliver nuclear warheads to distant enemy nations, ICBMs became the first effective space rockets. After a successful test flight in 1957, a Russian R-7 ballistic missile launched the world's first artificial satellite. The United States' early ICBMs were smaller and less powerful than the Soviet versions; however, they appeared powerful enough to be used as space launch vehicles.

An Artificial Moon



The Soviet Union stunned the United States with the successful launch of Sputnik 1 on October 4, 1957. Courtesy of NASA

By the mid-1950s, both the Soviet Union and the United States were competing to be the first to put an artificial satellite into orbit around the Earth. In 1957, the Soviet Union secretly launched the world's first artificial satellite, named Sputnik. The satellite was an embarrassment that stunned all Americans. This was during the *Cold War*, a period of rivalry between the political systems of Western-style democracy and totalitarian socialism, and Sputnik made it appear that the Soviet Union was technologically superior to the United States.

Sputnik was a polished silver sphere about the size of a beach ball. It passed over the United States every 90 minutes, emitting radio beeps for 22 days, until its batteries were depleted. It remained in silent orbit until January 4, 1958. Little was known at the time about other capabilities the satellite might have, such as spying on American facilities. In fact, it did little besides broadcasting its beeps.

The Soviets sent a second satellite into orbit. Sputnik 2 was not only larger, but it also carried a live dog named Laika. The Soviets had not yet figured out how to successfully de-orbit a satellite, so Laika would not survive.

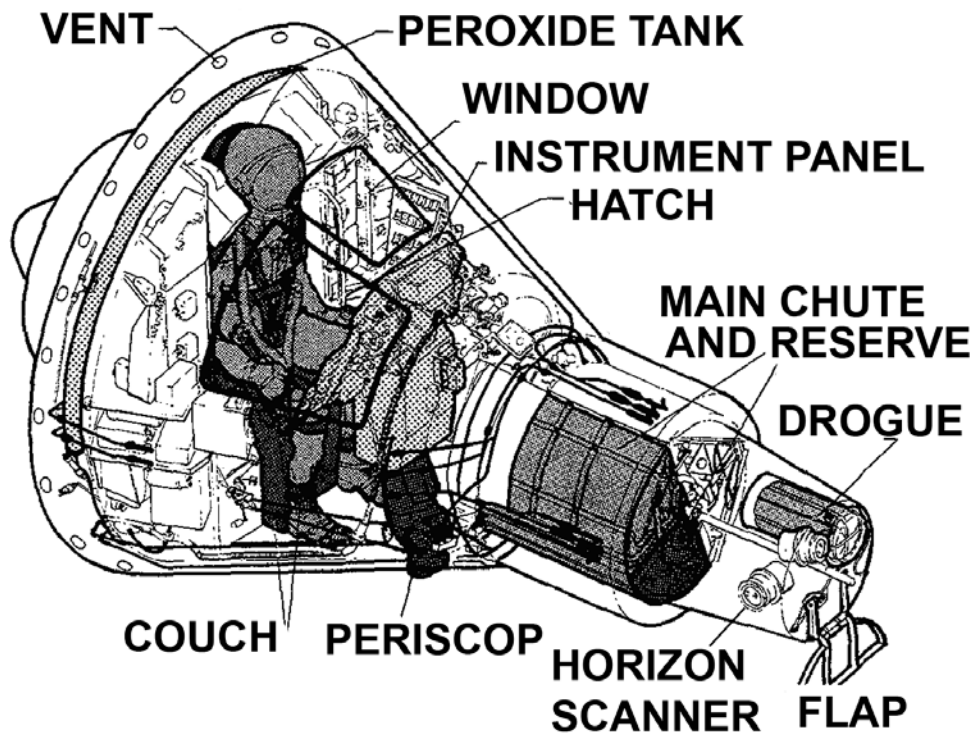
After a second attempt, the U.S. launched the Explorer 1 satellite into orbit in 1958. It was shaped like a small, 3-foot-long missile. It transmitted data for five months and remained in orbit until 1970. Its measurements gave the first indications of the

existence of the Van Allen radiation belts. You will learn more about these radiation belts in *Chapter 6: A Threatening Space*.

The Mercury Program

America's first human spaceflight program was Project Mercury. Its objectives were to orbit a manned spacecraft around Earth, investigate man's ability to function in space, and recover both man and spacecraft safely. The program would require a launch vehicle, a spacecraft, and an astronaut.

The launch vehicle would come from America's supply of ICBMs, but the spacecraft would be a new invention. Maxime Faget, a NASA engineer, proposed an innovative design shaped like a cone with a convex, blunt base. He believed this shape would slow the craft down and minimize friction-generated heat during reentry. The capsule was as small and lightweight as possible, and its base was covered with heat-resistant material. The capsule provided seating, communications, and life support for a single astronaut.



The Mercury Capsule had limited room for the astronaut. Courtesy of NASA

Astronaut candidates were recruited from the ranks of military jet pilots. They could be no taller than 5 ft 11 in., less than 40 years of age, and be in excellent physical condition. Thirty-two men were sent for intensive mental and physical stress tests. On April 9, 1959, NASA announced its first astronauts, known as the Mercury Seven.



The Mercury Seven. Front row (l-r) Walter Schirra Jr., Donald "Deke" Slayton, John Glenn Jr., and Scott Carpenter. Back row (l-r) Alan Shepard, Virgil Grissom, and Gordon Cooper. Courtesy of NASA

NASA hesitated to put a human in danger without further confirmation that the life support systems were adequate and that the astronauts could function effectively during launch and weightlessness. Instead, a chimpanzee named Ham took part in the next test flight. There was a slight malfunction during ascent, but Ham coped and performed his tasks well. As did Enos, the next chimpanzee to go into orbit. Enos performed remarkably well on his assigned tasks, which were more complex than Ham's had been. This was especially noteworthy because in one set of tasks, another malfunction resulted in the chimp being punished for every correct response instead of the incorrect ones. His persistence in continuing to respond correctly despite the mild electric shocks to the soles of his feet implied that human astronauts would be able to perform properly under significant stress in space.

The Soviets beat America into space again when on April 12, 1961, cosmonaut Yuri Gagarin became the first man in space. His spacecraft completed one full orbit of the earth in a flight that lasted 1 hour, 48 minutes. NASA launched the first American, Alan Shepard, into space on May 5, 1961. The success was comparatively unimpressive, as the flight was only suborbital. Gus Grissom completed a second suborbital mission, but the Mercury capsule sank after it landed in the ocean Grissom was able to get out and was retrieved.

NASA finally put its first astronaut into orbit on February 20, 1962. John Glenn flew three orbits in five hours. Before reentry, a faulty sensor suggested that the heat shield might have come loose, but procedures were adjusted, and the landing went smoothly. During the final mission of the Mercury program, Gordon Cooper pushed the American endurance record to 34 hours 20 minutes on a 22-orbit flight. With this, the Mercury program had satisfied its mission.



The first American manned rocket launched May 5, 1961 from Cape Canaveral Launch Complex 5. Courtesy of NASA

The Next Step: Gemini

In 1961 President John F. Kennedy called for America to “land a man on the moon and return him safely to Earth” by the end of the 1960s. NASA needed to develop technology that allowed astronauts to fly as a team for more than a week, work outside the spacecraft, rendezvous two spacecraft to dock in orbit, safely reenter the atmosphere, and land. The program to achieve this was called Gemini, from the Latin word for twins, because the new spacecraft would carry two astronauts.

The Gemini capsule was similar to Mercury's but was 50 percent larger so that two astronauts could sit side-by-side, and there were two hatches. Gemini's expanded equipment and fuel requirements nearly tripled its weight, so a Titan II missile was chosen as the launch vehicle. In total, there were twelve Gemini missions.



NASA astronaut, Ed White, conducted the first American spacewalk during the Gemini 4 mission in June of 1965. Courtesy of NASA

After two unmanned missions, the first manned mission, Gemini III, took off on March 23, 1965. Rookie astronaut, John Young, joined veteran Gus Grissom on a three-orbit mission around the Earth. NASA used the Gemini IV through XII missions to perfect their methods for extravehicular activity (EVA), commonly known as space walks, and to practice rendezvous and docking maneuvers that would be needed to prepare the later Apollo spacecraft to go on to the moon. Each Gemini mission had its issues and surprises, but the astronauts reacted well and survived each life-threatening event.

"Manned" Spaceflight?

In early spaceflight, cosmonaut Valentina Tereshkova was the only woman to go into space. A few women scientists and engineers contributed behind the scenes, but NASA accepted no women as astronauts.



Jerrie Cobb, a member of the unofficial Mercury 13, stands next to an actual Mercury capsule. Courtesy of NASA

In the early 1960s, a group of highly qualified female civilian pilots went through the same astronaut testing as the men. Dr. William "Randy" Lovelace II thought that women might provide advantages in that they are lighter in weight, and require less food and oxygen than men. Thus resulting in less fuel required for launch. In 1961, 13 women passed those tests with no medical reservation. They later became known as the Mercury 13. Three of them (Jerrie Cobb, Wally Funk, and Rhea Hurrle) went on to take additional astronaut tests. Although their results were impressive, they could not meet NASA's selection criteria of being jet pilots and graduates of a military test pilot school, since those options were not available to women in the 1950s.

The Mercury 13 never became official astronaut candidates, but their successful testing made the news.

Leaders of the Soviet space program were afraid the U.S. might achieve sending the first woman into space, so in February 1962, five women began their training as cosmonauts. Valentina Tereshkova's orbital mission sent a message to the world that women had more opportunity in the Soviet Union than in the United States.

NASA eventually named its first female astronauts in 1978: Anna Fisher, Shannon Lucid, Judith Resnik, Sally Ride, Rhea Seddon, and Kathryn Sullivan. All were mission specialists (not pilots) for the space shuttle program. Finally, in 1983, Sally Ride would become the first woman in space.

By the end of 2021, 50 female NASA astronauts have flown to space. Two women, Eileen Collins and Pamela Melroy, have served as space shuttle pilots and commanders. Three women (Peggy Whitson, Sunita Williams, and Shannon Walker) have served as commanders of the International Space Station.



First Female Astronaut, Sally Ride. Courtesy of NASA

Conclusion

Mankind's long-held dream of flying through the air and beyond finally became real during the first half of the 20th century. In only 50 years, powered flight progressed from a one-minute hop a few feet above the ground to missiles that could travel hundreds of miles. In one more decade, rockets were carrying humans into orbit for up to two weeks at a time. This amazing feat was accomplished through a complex combination of international politics, human ingenuity, a spirit of adventure, and a search for knowledge. The consequences of this achievement even extended to improving gender equality. The stage was set for people to travel beyond the influence of Earth's gravity.

Critical Thinking

1. Why was it necessary to practice procedures such as orbital rendezvous and EVAs after they had been worked out on paper?
2. Which country (the Soviet Union/Russia or the United States) has shown more gender equality in its space programs? Explain.

New Vocabulary

ballistic missile
gyroscope
supersonic flight

Study Guide

1. Who were the three pioneers of liquid-fuel rocketry?
2. How did Wernher von Braun come to be a scientist in America?
3. What were the objectives of the Mercury program?
4. Who set the goal of a moon landing?
5. What were the objectives of the Gemini program?

6. Who were the first women to:

(A) Fly into space?

(B) Pilot a spacecraft?

Onward to the Moon

What You Will Learn to Do

You will learn about the Apollo program which landed 12 American astronauts onto the surface of the moon. Six of the 12 moonwalkers joined NASA from the ranks of the U.S. Navy, while another four astronauts from the Navy orbited the moon during Apollo without landing.

In addition to learning about the American space program, you will also learn about the space programs in other countries.

Skills and Knowledge You Will Gain Along the Way

- ✓ Understand the goals of the Apollo lunar program.
- ✓ Learn what accomplishments and failures occurred along the way to moon.
- ✓ Recognize the importance of Skylab.
- ✓ Appreciate the long-term significance of the Mercury, Gemini, and Apollo programs.
- ✓ Learn about the space programs in other countries.



The moon with views of the Lunar craters and seas. Courtesy of iStock, Credit Abriendomundo

Project Apollo

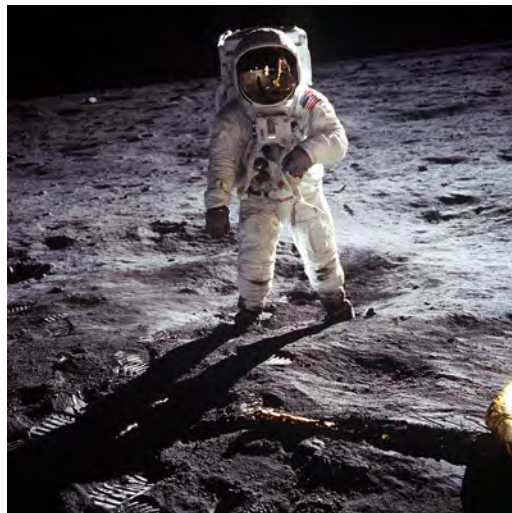
The Apollo program, declared a national priority by John F. Kennedy, was the program that would take man to the moon. Across the entire country, a workforce of 400,000 government and civilian contractors came together to enable NASA to reach Kennedy's audacious goal on July 20, 1969.

The Apollo spacecraft consisted of 2 components: a Command and Service Module (CSM) and a Lunar Module (LM). The CSM contained the crew quarters and flight control, while the LM was used for landing on the moon. Apollo was launched to the moon on the Saturn V rocket.

Apollo 1 was supposed to have been the first crewed flight. The crew was comprised of Gus Grissom, Ed White, and rookie astronaut Roger Chaffee. Sadly, during a test of their spacecraft, a fire broke out inside the spacecraft. The fire spread rapidly and the crew was unable to get the hatch open and perished in the fire. The tragedy caused a major rethinking and redesign of the Apollo spacecraft and procedures to create a safer spacecraft.

Until it was safe to launch missions with humans aboard, the next missions would be uncrewed. Apollo 6, the last uncrewed test, was designed to put the whole vehicle through testing from launch to reentry of the Command Module.

Apollo 7 was the first crewed flight. After 11 days in space, and successfully performing burns and docking maneuvers, the crew re-entered the Earth's atmosphere and splashed down in the Atlantic Ocean. Apollo 8 was the first crewed flight to venture out of Earth's orbit all the way to the moon's orbit. The crew stayed in lunar orbit for 20 hours (making 10 full orbits) before coming back to Earth. Apollo 9 and 10 would be more testing of the hardware including taking the Lunar Module down close to the surface, but not actually landing.



Buzz Aldrin during his history-marking lunar excursion on July 20, 1969. Courtesy of NASA

Apollo 11 was the first landing of humans on the moon. On July 20, 1969, Neil Armstrong made his historic "one step" to become the first human to set foot on the moon's surface. The flight wasn't without difficulty though. After the targeted landing area was deemed unsuitable, Armstrong took manual control and landed about four miles downrange. He and Buzz Aldrin then spent about four hours on the surface, collecting samples and setting up scientific experiments. Pilot Michael Collins remained in the Command Module watching from above. The lunar excursion was televised worldwide and drew massive press coverage. All three returned to Earth and enjoyed a hero's welcome.

Apollo 12 would return to the moon. As mentioned in Chapter 1, during the launch, lightning struck the rocket, not once, but twice. After nearly a minute of troubleshooting, the crew was able to get things straightened out, and the mission was able to proceed.

Apollo 13 was the third mission slated to land men on the moon, but would become known as NASA's most successful failure. The original Command Module pilot, Ken Mattingly, had to be replaced by Jim Swigert just three days prior to launch after being

exposed to the measles. That was only the beginning of the problems. Almost 56 hours after lift off, the Number 2 oxygen tank exploded. The explosion also caused the loss of the other oxygen tank, plus all three fuel cells that supplied power to the CSM during flight. The crew suffered from lack of food, water, and sleep. The temperature inside dipped to 38 degrees Fahrenheit. Instead of landing on the moon, the crew had no choice but to slingshot around the moon and head straight back to Earth. Through the skill of the crew and all the people helping back on Earth, Apollo 13 splashed down in the Pacific Ocean six days after launch.

Apollo 15 brought the first Lunar Rover Vehicle (LRV) to the moon, which the astronauts used to travel farther away from the LM than in the prior three landings. Astronauts Dave Scott and James Irwin conducted three moonwalks (totaling 18 hours and 37 minutes) and deployed the first satellite into lunar orbit. They also returned to Earth with a 170 pounds of lunar soil and **regolith** samples.

Due to budget cuts, Apollo 17 would be the last mission to the moon, as of this writing. Harrison Schmitt, a geologist and the first non-military astronaut to walk the moon, collected a record 243 pounds of lunar samples. The analysis of all these samples will allow for the planning of future habitation environments on the moon.



Astronaut Jim Irwin uses the Lunar Rover Vehicle to explore the surface of the moon. Courtesy of NASA

New Vocabulary

regolith—
fine lunar dust

Skylab Space Station

Skylab was America's first orbital space station. NASA built it using hardware left over from the canceled Apollo missions, converting an unused S-IVB rocket stage into a space station. Skylab was launched on May 14, 1973, on top of a Saturn V rocket. It sustained damage during the launch. The micrometeoroid shield detached from the station and was lost, one of the two solar arrays was lost, and the other would not fully deploy. The mission now became a rescue and repair mission.

Ten days after their arrival, the station was fully operational. They stayed for 18 more days performing experiments before returning to Earth. Skylab used many new technologies, such as solar panels to power the station. Far less cramped than prior American space capsules, Skylab even had a shower and toilet for the astronauts.

Just three missions launched to Skylab. It was inhabited for 171 days and provided NASA with valuable data and experience about longer space missions.



Astronaut Jack Lousma takes an actual water shower aboard Skylab. Courtesy of NASA

A Worldwide Endeavour

In all, less than a dozen countries have developed and launched their own orbital rockets. With the United States being ahead in the space race, Russia and China are not far behind. North Korea was the latest country to join the ranks of space powers.

Soviet Union/Russia

When the Space Race between the United States and the Soviet Union first began, it was the Soviets setting the milestones. The Soviet program placed the first satellite in space, the first animal in orbit, the first spacecraft to leave Earth's orbit, the first interplanetary probe, the first human in orbit, the first probe sent to Mars, and the first woman into space. However, it was the one “first” they failed to achieve that set the tone for decades to come—losing the race to the Americans to be the first nation to land humans on the moon.



Russia's Mir Space Station. Courtesy of NASA

With the race to the moon lost, the Soviets turned their attention to orbital space stations. The first space station, Salyut 1, was launched in April 1971. Two crews were sent to the station at separate times; however, both missions ended in failure. The lessons learned from the Salyut orbital stations, however, led to the development of the much larger Mir space station. Mir was the first modular space station, and it had to be assembled in orbit. The first module was launched in 1986. By the

time its assembly was finished in 1996, Mir consisted of seven pressurized modules.

After the collapse of the Soviet Union, Russia's newly formed space agency, Roscosmos, took over Mir. During its 15-year history, nearly 30 missions targeted the space station. Cosmonaut Valeri Polyakov spent 437 consecutive days on Mir; a record for the longest time a human has spent continuously in space. Astronauts from more than a dozen countries visited the space station, including the United States, before its 2001 fiery re-entry.

The Russians have been a full partner in the International Space Station since its beginning. They have constructed a handful of modules and provided crew launches and station-orbit-reboosting services. The module, now known as Zvezda, became the crew accommodations module for the Russian side of the ISS.

China

China has been a spacefaring nation since April 24, 1970, when it became the fifth country in the world to successfully launch an orbital rocket. In 1990, using essentially a modified Soyuz capsule, China launched its first taikonaut (a Chinese astronaut) into orbit on a mission that lasted 21 hours.

During the midst of the Cold War era, the leader of China, Chairman Mao, declared that his country needed to keep pace with the Soviets and Americans in the development of space launch capability. As the Apollo program approached the first human landing on the moon, Mao ordered that China train its own taikonauts and get them into space. Following the death of Mao in 1976, progress on the country's space program largely stalled.

In 1993, the China National Space Administration (CNSA) was formed to lead a new era of space exploration for the communist nation. During 2003, the CNSA announced the Chang'e lunar exploration program. Several spacecraft were launched and reached orbit. Chang'e 5 even included a lunar sample-return component that returned the first new lunar samples to Earth in more than 40 years.

China launched the Tianwen-1 mission to Mars in July 2020. The space craft arrived in orbit around the planet nearly seven months later and landed. China is the only nation to land on Mars successfully in its first attempt.

In 2021, the first module of China's Tiangong Space Station was lofted into orbit. It is expected to be about one-fifth the size of the International Space Station and will be used for long-duration stays in orbit, testing technologies, and conducting experiments. Russia and the European Space Agency are cooperating with China, however, NASA is prohibited from working with China on space endeavors. Which means that China is barred from the ISS as well.



Launch of China's Long March 3B rocket in 1997. Courtesy of Wikimedia Commons, Credit AAxanderr

European Space Agency

The European Space Agency (ESA) was founded in 1975. The 10 founding members of the ESA included Belgium, Denmark, France, United Kingdom, Italy, the Netherlands, Sweden, Switzerland, and Spain. Ireland joined later that same year. As of March 2022, there are 22 European nations with full member status in the ESA, as well as nine other countries that are either associate members or have cooperation agreements with the agency.

The joint European effort successfully launched its first satellite in 1968. Since then, the ESA has launched many satellites and telescopes to study the Earth, the solar system, and the universe. Earth observation missions have always been a high priority for the ESA, but it has sent spacecraft to study Mars, Venus, Mercury, Saturn's moon Titan, Jupiter's Galilean moons, and multiple comets.

The precursor agency to the ESA partnered with NASA to construct Spacelab, a reusable science module carried within the cargo bay of at least 22 space shuttle missions. That cooperation continued with the construction of the International Space Station. ESA supplied the Columbus module and Node 2 connecting module, as well as delivering cargo to the ISS five times. The cargo was delivered using the European-

built *Automated Transfer Vehicle (ATV)*, an unpiloted cargo carrier designed to supply the International Space Station.

Human spaceflight was not an original part of the ESA's charter; however, NASA invited ESA to send astronauts on space shuttle missions. Germany's Ulf Merbold was the first ESA astronaut to make it to orbit. ESA astronauts have served as crew members on more than 30 American and Russian space missions.

Conclusion

While the Mercury, Gemini, and Apollo programs all originated mostly due to the Cold War with Russia, they would have happened eventually. We, as humans, have a need to explore. The programs all made technological advances, many of which were incorporated into other things. The samples brought back from the moon are still being studied today. The Apollo missions continue to inspire future generations to pursue careers in space exploration. The program, while not without problems along the way, was a major success.

As civilization and technological prowess have advanced, it is no surprise that many countries have developed their own national space program. As the number of nations with a space program has increased, so has the level of cooperation between the spacefaring nations.

Critical Thinking

New Vocabulary

regolith

1. The Apollo program brought the nation together towards a single goal. Why do you think that was?
2. Apollo lunar samples continue to provide information about the moon. What do you hope the scientists find?
3. Should China be viewed as a rapidly advancing space power, even though its progress has come in slow, incremental steps?
4. If the US and USSR had not captured German aerospace scientists during the later days of WWII, how differently might the Space Race have gone?
5. How might the emergence of national space programs in the Middle East or Africa change the regions for the better?

Study Guide Questions

1. Which Apollo mission allowed the first man to walk on the moon?
2. Who was the first man to step onto the lunar surface?
3. What now-common new technology did the Skylab space station utilize?
4. What's the difference between the Lunar Module and the Lunar Rover?
5. What was the reason the Apollo program was shut down?

6. Who were the 10 founding nations of the European Space Agency?
7. What was the name of the first modular space station assembled in orbit?
8. What is an astronaut from China called?

Reusability and Living in Space

What You Will Learn to Do

America's prior space programs—Mercury, Gemini, and Apollo—had been laser focused on the task of beating the Soviets in the race to conquer space travel and reach the moon. The space shuttle program offered NASA a chance to spread the agency's wings and start to explore what was possible in space. The size of astronaut crews increased, and they were able to spend longer durations in orbit. NASA and its astronaut corps learned how to live on and work with a spacecraft, as well as what was possible during spacewalks. The skills learned and knowledge gained gave NASA the confidence to pursue the International Space Station (ISS).

Skills and Knowledge You Will Gain Along the Way

- ✓ Learn how the space shuttle program revolutionized space travel.
- ✓ Appreciate how international partnerships made a new international space station possible.
- ✓ Learn how breakthroughs from microgravity research are making life better here on Earth today and preparing us for deep space journeys tomorrow.
- ✓ Recognize the new market of space tourism.



Astronauts from many nations working and laughing together on the International Space Station. Courtesy of NASA

The Era of Winged Spacecraft

With the Space Race concluded and future missions to the moon and beyond canceled, NASA changed its focus to human spaceflight efforts a little closer to home—within low Earth orbit. During the 1960s, NASA studied the possibility of a reusable spaceplane. In the 1976, this resulted in the Space Transportation System (STS), informally called the space shuttle program.

The new spacecraft was to consist of a reusable winged **orbiter**, an expendable external fuel tank, and two reusable solid rocket boosters. Like the Apollo program before it, the space shuttle program utilized contractors from across the country to construct the major components.

New Vocabulary

orbiter—
the spaceplane component of the space shuttle

30 Years of Space Shuttle Missions

There were 135 missions flown by the five space shuttle orbiters—Columbia, Challenger, Discovery, Endeavour, and Atlantis—during the 30-year history of the space shuttle program. In 1981, the Columbia rocketed up and away as the first crewed space shuttle. Never before in the history of exploration had a spacecraft launched with a crew on board for its very first mission.

Major personnel firsts included:

- Sally Ride (1983) – the first American woman in space.
- Guion Bluford (1983) – the first African American in space.
- Kathryn Sullivan (1984) – first spacewalk by an American woman.
- Mae Jemison (1992) – the first African-American woman to fly in space.
- Eileen Collins (1999) – the first female commander of an American spacecraft.
- Barbara Morgan (2007) – the first teacher to fly in space.



Mission specialist Sally Ride floats in space shuttle Challenger. Courtesy of NASA

Due to the sheer volume of missions flown, it would take a very large book to adequately cover the entire history of the space shuttle program. Therefore, we're highlighting only a few of those missions here. Notable deployments from the shuttles' bays included:

- Magellan – a robotic space probe to Venus.
- Galileo – a robotic mission to study Jupiter and its moons,
- Hubble telescope – the first of NASA's four **Great Observatories**.

New Vocabulary

Great Observatories—
four space-borne observatories designed to conduct astronomical studies over many different wavelengths

Other highlights included the return of John Glenn to space in 1998 (at 77 years old, the oldest person to fly in space at the time), nine missions docking with the Mir space station, 37 missions docking with the International Space Station, and many flights of the *Spacehab* module (a privately developed and funded science research module).

Sadly, two missions resulted in the loss of their crews. In 1986, space shuttle Challenger detonated soon after takeoff, and the entire crew was lost, including Sharon Christa McAuliffe, a high school teacher. Years of success had led to overconfidence within NASA, which would largely be to blame for the loss of Challenger and its seven-member crew. The night before the launch an engineer advised NASA to scrub the launch due to the cold weather, however, his warning went unheeded. The next morning, during liftoff, an O-ring seal on one of the boosters failed, allowing hot gas to burn through the external tank, which subsequently tore apart the rocket at an altitude of 46,000 feet.

In 2003, Space shuttle Columbia was only 16 minutes away from completing its mission when it was torn apart by the heat and atmospheric forces of reentry. During launch, a large piece of foam insulation had broken off and struck the orbiter's left wing. The resulting hole allowed searing hot gases to enter the wing and incinerate the spacecraft from within. The seven crew members were all lost, but the data garnered from their science experiments survived. The loss of Columbia led to the decision to cancel the space shuttle program, but not before the construction of the International Space Station could be completed. The final flight of the program was by space shuttle Atlantis, which landed at Kennedy Space Center on July 21, 2011.



The ill-fated Challenger crew takes a moment to pose for a photo. Courtesy of NASA



The crew of space shuttle Columbia pose for a portrait before the doomed mission. Courtesy of NASA

International Space Station (ISS)

During his State of the Union address to Congress on January 25, 1984, President Ronald Reagan declared that NASA would construct a permanently manned space station within a decade, and invited other nations to participate in the program. The orbital platform was called Space Station Freedom.

The Soviet Union had already launched a series of Salyut and Almaz space stations during the 1970s and 1980s. In 1986, the Soviets sent up the first module of the Mir space station, which would become the first modular space station. After the collapse of the Soviet Union in 1991, Mir was transferred to Russia. As a sign of goodwill in 1993, President Bill Clinton offered Russia the opportunity to join the Space Station Freedom program as a full partner. The planned orbital research laboratory continued to undergo redesigns and eventually was renamed the International Space Station.



The International Space Station as viewed from the SpaceX Crew Dragon capsule on Nov. 8, 2021. Courtesy of NASA

Construction Project Among the Stars

On January 29, 1998, representatives from the United States and 14 other countries signed a new agreement spelling out the final framework for the design, construction, and utilization of the ISS. The construction of the ISS required more than 40 rocket launches, including 36 space shuttle missions. It contains 16 **pressurized modules**, is about the size of a football field and has a mass of 450 tons. Inside, it is as large as a six-bedroom house. It is considered to be the most expensive construction project ever, with approximately \$150 billion invested by the partner nations during its 10 years of construction.



Astronauts Robert Curbeam, Jr. and Christer Fuglesang participate in a spacewalk to continue construction of the ISS. Courtesy of NASA

Russian cosmonauts Sergey Krikalev and Yuri Gidzenko, and NASA astronaut William Shepherd were the first residents of the ISS. Since that time, the ISS has been permanently occupied by international teams of astronauts and cosmonauts.

An Orbital Laboratory for Microgravity Research

As of March 2022, more than 250 spacefarers from 19 countries have been aboard the ISS. Sixty-seven expedition crews have conducted more than 2,500 experiments. The main purpose of the space station has been to conduct microgravity research that cannot be done on Earth, as well as to study the health effects of long-duration spaceflight on the human body.

New Vocabulary

pressurized module—
an enclosure that
maintains a selected
atmospheric pressure

New Vocabulary

osteoporosis–

a disease which affects the bones, causing them to become porous and brittle

Research done aboard the ISS has led to advances and breakthroughs in many fields. The ability to study cells in microgravity has enabled fundamental research into diseases and possible cures. Long-term stays aboard the space station give us the opportunity to discover, and begin solving, the health challenges that astronauts will face on missions to explore Mars. Also, the knowledge gained about bone and muscle loss in space can be applied to ailments suffered on Earth, like **osteoporosis**. The unique environment on the space station has allowed us to study and collect data about the composition of the universe. Astronauts have been able to monitor the Earth from a higher perspective, giving us views of the planet's water, landmasses, vegetation, climate, and up-to-the-minute orbital views of natural disasters.

What's Next?



Flight engineer, Kayla Barron, monitors an agriculture experiment onboard the space station. Courtesy of NASA

The ISS was originally commissioned for 15 years, which many portions of the station have already exceeded. The United States and all the international partners—except for Russia—have expressed a desire to use the ISS for research until 2030, after which it will be decommissioned and deorbited.

NASA does not have any current plans to construct a new space station in Earth orbit. The agency believes private companies will begin placing commercial research stations into orbit within a decade, and NASA instead is

focusing on returning humans to the moon, and eventually onward to Mars.

Old Space vs. New Space

It has been less than four generations since we first ventured into space. In that small span of time, we have gone from sending chimpanzees and dogs in capsules to space, to now sending tourists into space, and to having probes exiting the farthest boundaries of the solar system. Space exploration is changing rapidly, for both governments and private businesses.

On July 20, 2021, a Blue Origin spacecraft called New Glenn carried four so-called "space tourist" on a suborbital journey 62 miles above the Earth, lasting 10 minutes. One of these tourists was aviation pioneer Wally Funk. At 82 years old, she is the oldest woman to go to space to date. Funk is one of the original members of the Mercury 13, a group of women who went through astronaut training in the early 1960s but were never allowed in space. Other tourists, including William Shatner (Captain Kirk from the Star Trek), Jeff Bezos (owner of Amazon and Blue Origin), and Sir Richard Branson (owner of Virgin Galactic), are some of the first pioneers to benefit from the "new space" race.



The crew of Blue Origin's first human suborbital spaceflight celebrates after a safe landing. Jeff Bezos (second from left) and Wally Funk (far right) were both crewmembers. Courtesy of Blue Origin

Old Space could be defined as the time beginning at the end of World War II and ending with the retirement of the space shuttle in 2011. Considered a matter of national security during the Cold War, Old Space was built with government contracts and military budgets. Budgets were “at any cost,” both in money spent and in lives risked.

Old Space led to countless technological advances that have helped create almost everything that makes up the modern world—from memory foam to digital cameras. While these advances were funded by governments, eventually the whole world came to reap the benefits.

New Space can be characterized as private companies competing to push the boundaries of space exploration, and to fill the gap left by the retired space shuttle. New Space is in space for profit, through communications, tourism, mining, energy, medical, and biology. The possibilities are endless and believed to be quite lucrative. New Space companies include: Blue Origin, founded by Jeff Bezos in 2000; SpaceX, founded in 2002 by Elon Musk; Virgin Galactic, founded by Richard Branson in 2004; ULA (United Launch Alliance), a joining of forces between government contractor juggernauts Boeing and Lockheed Martin in 2006; RocketLab (founded in 2006); and Astra (founded 2016).

Space Tourism

New Vocabulary

overview effect—
term defined by
astronauts at the
overwhelming first sight
of Earth from orbit

Space tourism is defined as civilians going to space for the adventure of it, and willing to pay for their seat on an available spacecraft. The urge to explore is at the core of the human spirit, and the promise of experiencing the **overview effect** is attractive to many. Building on this attraction is one more step in getting people interested in and invested in space exploration, which is often just as important as other needs that have led to space travel.

Factors That Led to This Point



British entrepreneur, Richard Branson on a Virgin Galactic Unity 22 suborbital spaceflight. Courtesy of Virgin Galactic

space tourist, traveling to the ISS aboard a Soyuz rocket and returning to Earth one week later. He paid a reported \$20 million for the trip. (Poitevien, 2021)

Twenty years later, Richard Branson demonstrated a form of space tourism on his suborbital trip aboard the Virgin Galactic Unity 22 spacecraft. Estimates for a ticket aboard future Virgin Galactic flights are \$450,000. (Brett, 2022)

It has been the dream of many to be an astronaut. NASA tried—and failed—to make this dream a reality for the “everyman” with the launch of schoolteacher Christa McAuliffe aboard the space shuttle Challenger in 1986. After McAuliffe's death, NASA was reluctant to offer seats to the private sector.

Roscosmos sold astronaut seats to not just other countries, but to individuals. In 2001, Dennis Tito became the first

Conclusion

The history of the space shuttle and the International Space Station always will be intertwined. Without the versatility and payload capacity offered by the space shuttle, the ISS may not have been constructed. The space shuttle orbiters were workhorses able to adapt to a variety of missions. They offered NASA the opportunity to send more scientists and researchers into orbit and set the stage for longer-duration missions once the ISS was built and inhabited. Being able to conduct research in orbit 250 miles above the Earth has led to breakthroughs and new knowledge in a number of fields and will continue to do so for years to come.

“New Space” built onto the technical gains and lessons learned from Old Space, further opening the door for more commercial and private companies, and individuals, to explore the space above Earth. Operating at the company level, compared to government level, costs have been greatly reduced. After the space shuttle was retired in 2011, Russia’s national space agency, charged NASA as much as \$90 million per astronaut to ride on the Soyuz platform. By contrast, SpaceX is reported to charge around \$55 million per seat.

Critical Thinking

1. Why has America turned away from deep space exploration for more than 50 years?
2. What effect did the loss of the Challenger crew have on NASA and the nation as a whole?
3. What could have been done differently to prevent the loss of two space shuttle crews?
4. The space shuttle program allowed NASA to open up space to other nations. How can space exploration opportunities be used as a diplomatic tool?
5. Identify two companies that constitute New Space and research what their mission statements are.
6. What would be some of the financial benefits to a company for space exploration?
7. Research the media reaction to recent space tourist flights. Is the reaction mostly positive or mostly negative?

New Vocabulary

Great Observatories
orbiter
osteoporosis
overview effect
pressurized module

Study Guide Questions

1. What was the description used to describe the size of the ISS?
2. What name was given to the space station before it became the International Space Station?
3. What was the first of the Great Observatories that was put into orbit by the space shuttle?
4. Who was Mae Jemison?
5. How old was John Glenn when he returned to space on the space shuttle?
6. What was the date of the final mission of the space shuttle program?
7. Which president offered Russia the opportunity to join the space station program?
8. Name three companies that are defined as New Space?
9. In space travel and colonization, why is it critical to recycle waste products into reusable products?
10. What made NASA become reluctant to send private sector personnel into space?

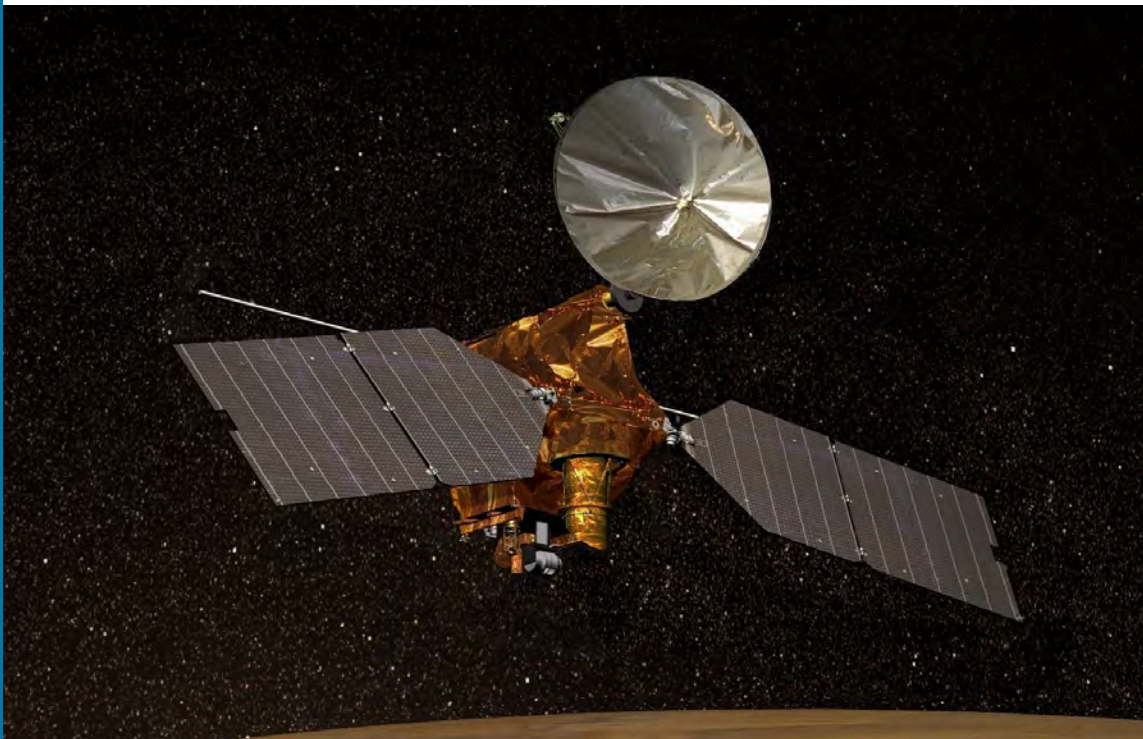
Back to the Moon, and Beyond

What You Will Learn to Do

After more than a half-century absence, NASA is returning to the moon. It will happen this decade. Early NASA missions have helped pave the way for us to explore not just the moon, but farther into our solar system. As national space agencies and private companies learn to work together, bold plans will be realized, to not just explore but to set up long-term bases on both the moon and Mars.

Skills and Knowledge You Will Gain Along the Way

- ✓ Recognize how using information from past experiences can help us in the planning of future missions and exploration.
- ✓ Learn that things aren't always as straightforward as they seem, and many bases must be covered for a mission to succeed.
- ✓ Understand how NASA's Artemis program is going to return Americans to the moon.
- ✓ Appreciate that space travel for humans can cause issues from radiation and other sources.
- ✓ Become familiar with American Percival Lowell's fascination with the planet Mars.



Artist's concept of NASA's Mars Reconnaissance Orbiter. Courtesy of NASA

Returning to the Moon

If we are to revisit and then colonize the moon, we need to look at how the first steps on the lunar surface helped us understand some of the many issues and hazards that these future missions may encounter. Using that information can help us choose how we will proceed. The early Apollo missions only spent a couple of hours on the lunar surface, but the longer missions spent as much as three days on the surface collecting rocks and conducting experiments.

Challenges of the Lunar Environment

The moon is a challenging place for human survival and equipment. The lack of atmosphere on the lunar surface is hazardous to equipment failure and increases the radiation risk to humans. There are also severe temperature fluctuations. Over the course of a full lunar day and night, the temperature on the moon can vary from around +392 °F to -328 °F. These are extreme temperatures, considering that water boils at 212 °F and freezes at 32 °F. Any vehicles, spacesuits, and equipment will have to be robust.

The regolith is another concern for lunar base activities. It is an exceptionally fine powder which can stick to equipment and spacesuits. The terrain of the moon includes features common on Earth, like craters, mountains, ridges, and plains, but all lunar volcanic activity has long since ceased. On the other hand, **micrometeoroid** activity on the surface is very prevalent. The lack of an atmosphere allows these small projectiles to readily crash into the surface. There is also some seismic activity due to moonquakes. The largest moonquake ever recorded was an earth equivalent magnitude of 4.0. Any exposed long-term component, structure, or system must be very well planned.



Artist illustration of a future lunar exploration checking out the moon's regolith. Courtesy of NASA

New Vocabulary

micrometeoroid—
a small particle of rock in space, usually weighing less than a gram

Resources Available on the Moon

Although the moon's environment is very inhospitable, it may provide many of the resources needed to build and sustain a future lunar base. Solar power could provide thermal and electrical power. Oxygen could be extracted from the regolith for breathing and water production, which could also be used on a forwarding mission to the farther reaches of our solar system. Extracted hydrogen could be used for fuel, and perhaps, along with lunar metals, for construction and building materials.

NASA's Artemis Program

The Artemis program is a United States-led international human spaceflight program. The program will be carried out predominantly by NASA, in partnership with the European Space Agency and the space agencies of several other nations. Its primary goal is to return humans to the moon, specifically the lunar south pole, by 2025. The program is named for Artemis, the Greek goddess of the hunt and the moon.

New Vocabulary

SpaceX—
a private American
aerospace manufacturer
founded in 2002 by Elon
Musk

**Gateway Lunar
Outpost**—
a multi-purpose outpost
orbiting the Moon that
provides support for
long-term stays on the
lunar surface



NASA's Artemis 1 mission is placed between the side-mounted boosters in preparation for launch in 2022. Courtesy of NASA, Credit Cory Huston

(HLS) contract award in July 2021. They will include the NASA Space Launch System for Orion, **SpaceX** Starship for the HLS, and Falcon Heavy for **Gateway Lunar Outpost** components.

A short-term goal of the Artemis program is landing the first woman on the moon. Mid-term objectives include establishing an international expedition team and a sustainable human presence on the moon. Long-term objectives are laying the foundations for the extraction of lunar resources and eventually to make crewed missions to Mars, and beyond, feasible.

The launch vehicles have been planned based on early mission concepts outlined by NASA in May 2020 and refined by the Human Landing System

Lunar Outposts

Another of the Artemis program is the Habitation and Logistics Outpost (HALO), which will provide command, control, and data handling capabilities; energy storage, power distribution, thermal control, communication, and tracking capabilities; stowage, environmental control, and life support systems. NASA has also proposed an Artemis Base Camp, which will be used to study technologies to use on Mars.

Mission to Mars

Mars is the fourth planet from the sun and the second-smallest planet in the solar system. Only Mercury is smaller. The red color of the planet is a result of the iron oxide prevalent on Mars' surface. Throughout history stargazers across the world have observed Mars' distinctive red color.

NASA's Mariner 4 was the first spacecraft to visit Mars successfully. It was launched on November 28, 1964, and made its closest approach to the planet on July 15, 1965. Many orbiters and landers have followed, including the successful Viking lander that revolutionized our understanding of the red planet. As technology progressed, so did space probes going to Mars. The Soviet Union and Russia, Europe, India, the United Arab Emirates, and China have also sent unmanned missions to Mars. Each has had varying degrees of success. In 2021, a total of 14 spacecraft were either in orbit or on the surface of the planet.

The current batch of rovers on Mars is led by NASA's Perseverance rover, which is searching for evidence of life. Its Ingenuity drone is the first vehicle of any kind to be flown over another planet's surface. Robotic missions are cost effective, because robots can work without rest and require no food, water, or oxygen. However, a human research presence on Mars will be essential for our understanding of the planet, and for the survival of the human race, as Mars may provide a place to live in the future.

The Long Journey to Mars

The distance to Mars from the Earth varies between 62 million miles and 236 million miles. This range is due to their elliptical (egg-shaped) orbits. If Earth and Mars had

perfectly circular paths, their distance would always be the same. Considering the distances involved, the transit time to Mars will be approximately six months.

Communication signals from Mars also take time to reach Earth. There is a delay of between 4.3 and 21 minutes, depending on Mars' orbit. Coordination of communications is essential, both for crews and mission planners. Especially it when it comes to the warning of impending solar storms. The distances and communication lag present many problems. If anything were to go wrong, sending a rescue mission would not be practical. Contingencies must be made in case contact with Earth is lost, even temporarily.

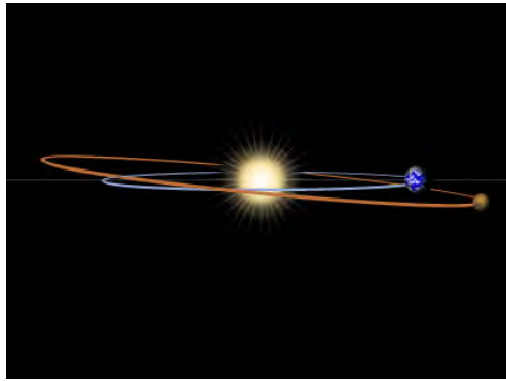


Illustration of the orbits of Mars and Earth around the sun during a close approach. Courtesy of NASA/MARS Exploration Program

Who Shall Go First?

Crew selection for the first missions will need to be thought through. The mission will likely last more than a year or two, so it will be very important for all crew members to have good relationships with one another. Who would you take? How would you get along with your fellow crew members?

You would need a commander in overall charge. The logistics of a mission to Mars are complex. What skills would be needed? How about a pilot, engineer, doctor, or biologist? All crew members would have to be very well trained, in not just their own fields. They would need a good understanding of all the other disciplines, in case any crew member would fall ill or have an accident.

A Perilous Voyage

One of the key issues with a mission to Mars is the prolonged effects of space itself. The prolonged period of weightlessness and reduced gravity can cause muscle wastage and bone issues, and cardiovascular efficiency decreases, even with exercise. There are also changes in vision and inner ear issues without gravity as a reference. There is even space motion sickness.

Living on Mars

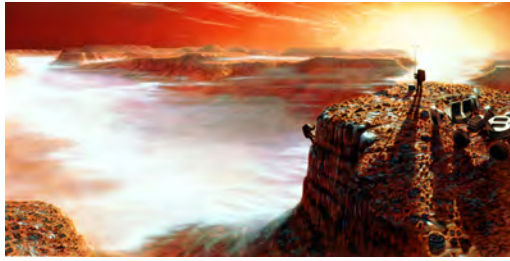
The living conditions on Mars will be different from on Earth:

- **Atmosphere.** There is a lack of breathable air on Mars, as the Martian atmosphere is primarily made up of a thin carbon dioxide layer.
- **Temperature.** Surface temperatures vary between -220°F in the wintertime at the poles, to $+70^{\circ}\text{F}$ over the lower latitudes in the summer, with an average temperature of about -81°F .
- **Reduced light.** Light on Mars is about 60 percent of that on Earth.
- **Low surface gravity.** Gravity on Mars is 38 percent of that on Earth.
- **Low atmospheric pressure.** The atmospheric pressure on Mars is only about one percent of Earth's.

New Vocabulary

non-ionizing radiation—
a type of low-energy
radiation

Radiation, however, may be the main risk for the mission to Mars. Mars does not have protective radiation belts that could protect inhabitants from the sun's harmful radiation like Earth does. Any potential crew member on Mars would run the risk of being exposed to both **non-ionizing radiation** and ionizing radiation. The results of exposure to ionizing radiation can lead to damage to the central nervous system and the formation of cancer cells. It can even damage our bodies' DNA.



Artist's concept of what the first exploration missions might entail. Courtesy of NASA

Once we have established a base on Mars, what comes next? *Terraforming*, or terra formation, means “Earth shaping.” It is the hypothetical process of deliberately modifying an atmosphere, temperature, or ecology of another planet to make it like conditions found on Earth, thus allowing humans to live there.

Terraforming would entail three momentous changes for humans to live

on Mars in the long term:

1. Build up the magnetosphere for the planet to be better protected from radiation.
2. Raise temperatures planet-wide.
3. Build up the atmosphere so that air pressure rises and the air is breathable.

To build up the atmosphere, colonists could implant **cyanobacteria** in the Martian soil to produce oxygen. If successful, the plan could then be upscaled to aid in the human exploration of Mars.

Mars missions will not be easy or straightforward, so we must always look at the information gleaned from missions of the past to help in the future.

New Vocabulary

cyanobacteria—
also called blue-green
algae, are microscopic
organisms found naturally
in all types of water

Finding an Earth 2.0

Beyond Mars, there may be the possibility of finding another planet to live on, an Earth 2.0 What should we look for when searching for a twin version of our home planet? There are several characteristics of our Earth that we will need to match.

Earth is a *terrestrial planet*. Terrestrial planets are made up of rocks or metals, have a hard surface, a molten heavy metal core, few moons, and various rocky topological features.

Our planet sits at just the right distance from the sun, in an area called the **habitable zone**. This is an area surrounding a star where the temperature is neither too hot nor too cold for liquid water to exist on the surface. An Earth 2.0 must have liquid water, since water is a necessary building block for life as we know it.

The star it orbits should be stable and close in size to our own sun so that a similar amount of radiation emits from it

It will need an atmosphere that could support life in the form we are familiar with.

Data derived from NASA's Kepler mission has shown that there could be as many as one Earth-like planet for every five sun-like stars in the Milky Way Galaxy. Beyond the Milky Way, there are many more potential Earth-like planets out there that are waiting to be discovered.

New Vocabulary

habitable—
the ability of a space to
support life

Kepler-452b

The closest version to a twin of our planet found, to date, is Kepler-452b. Discovered by the Kepler telescope in 2015, this Earth 2.0-type planet was found orbiting in the habitable zone of its sun-type star, Kepler 452. It is 60 percent larger in diameter than Earth, so it is classified as a “super-Earth” planet. The composition and mass of the planet are not yet known, but it has a good chance of being rocky.

Searching in the habitable zone of other stars in our galaxy has proven to be a good starting place to hunt for exoplanets similar to Earth-like candidates. So far, about a dozen planets in the habitable zone of a star have been discovered, but none come as close to being an Earth 2.0 as Kepler-452b.

NASA's Great Observatories

Traveling beyond our solar system, we will need to know as much as we can about the universe into which we are traveling. One of NASA's tools for doing so the Great Observatories program, a series of four space-borne observatories that study celestial bodies over many different wavelengths: electromagnetic spectrum, **gamma rays**, x-rays, visible light, ultraviolet light, and infrared light. The Great Observatories are also helping us in our search for Earth 2.0.

Hubble Space Telescope

The first of NASA's Great Observatories program, the Hubble Space Telescope, was launched in 1990 and named after astronomer Edwin Hubble. Hubble's observation spectrum ranges from ultraviolet light through visible light, and into near-infrared light. Over its years in operation, it has made over 1.5 million observations. Every modern-day astronomy textbook contains information based on its findings. Some of its discoveries include a comet hitting Jupiter, moons around Pluto, and **dusty disks** throughout the galaxy. The history of our expanding universe has never been better understood, thanks to the contributions of Hubble's observatories.



The Pillars of Creation within the Eagle Nebula is a place where young stars are being born. Courtesy of NASA/ESA/Hubble and the Hubble Heritage Team

Compton Gamma Ray Observatory

The second of NASA's Great Observatories program, the Compton Gamma Ray Observatory, was named in honor of Dr. Arthur Holly Compton. Compton observed high-energy cosmic phenomena, such as solar flares, gamma-ray bursts, pulsars, nova, and supernova explosions. Its Energetic Gamma Ray Experiment Telescope (EGRET) produced the *all-sky map*, a chart showing the positions of all celestial bodies. Another major discovery was *blazars*, which are **quasars** that have a jet of material shooting out into space near the speed of light.

New Vocabulary

gamma rays – electromagnetic radiation of the shortest wavelength and highest energy

New Vocabulary

dusty disks– areas of gas, dust, and debris that surround young stars

New Vocabulary

quasar– a black hole that is emitting an enormous amount of energy in the form of a beam

Chandra X-Ray Observatory

The Chandra X-ray observatory, launched in July 1999, and still active today, was named after Nobel prize winner Subrahmanyan Chandrasekhar. Chandra was designed to detect X-ray emissions from extremely hot parts of the universe, like exploded stars, clusters of galaxies, and matter that surrounds black holes. It can see the light from some quasars that have been traveling in space for over 12 billion years. Chandra has made a profound range of discoveries, from witnessing powerful eruptions of supermassive black holes, to being involved in gaining direct proof of the existence of **dark matter**.

New Vocabulary

dark matter—
material that cannot be
seen directly; it is
composed of particles
that do not absorb,
reflect, or emit light

Spitzer Space Telescope

The Spitzer Space Telescope, launched in August 2003, A space-borne, infrared observatory, Spitzer reached into the deepest realm of the universe to study celestial objects. It was also a key scientific and technical cornerstone for the *Astronomical Search for Origins (ASO)* program, a decades-long study addressing the origins of the universe and life.



The Spitzer Space Telescope captured this infrared image of the Helix Nebula. Courtesy of NASA/JPL-Caltech/Univ. of Arizona

Many key discoveries were made during Spitzer's 16 years in operation. It has studied comets and asteroids, star and planet formation, the composition of interstellar dust, and the evolution of galaxies from the ancient universe to today. It even identified a new ring around Saturn. One of its most notable discoveries is seven earth-sized planets surrounding a star 40 light years away in the TRAPPIST-1 system. To give you an idea of how far away this is, consider that light zips through interstellar space at 186,000 miles per second. If we were a space shuttle that traveled five miles per second, it would take about 37,200 human years to travel one light year.

Conclusion

Our understanding of past missions, especially in the Apollo era of the 1960s and 70s, has stood us in good stead for understanding future missions to both the moon and Mars. History has shown that humans have long had a fascination with space travel to the moon and beyond.

Being part of any future mission will rely on a good understanding of what is required. We've covered several points that may help you understand the possible requirements for future exploration.

Critical Thinking

1. Why should we return to the moon?
2. Why is Mars likely to be the next long-term goal after the moon?
3. Logistics of getting to the moon and Mars are many and complicated. What are they?
4. Why should human physiology be studied for long-duration missions?
5. Lunar exploration is within our reach again. It is only a relatively short journey for humans to travel to the moon. Why is lunar exploration critical to traveling farther in our solar system?
6. A trip to Mars would likely be up to two years, so the risk of low gravity and radiation need to be addressed. How?
7. The building of a staged mission is likely to be the best solution. What components will this entail?

New Vocabulary

cyanobacteria
dark matter
dusty disks
gamma rays
Gateway Lunar Outpost
habitable
micrometeoroid
non-ionizing radiation
quasar
SpaceX

Study Guide Questions

1. What are some dangers of lunar and Martian expeditions?
2. Name three challenges that make the moon a difficult place for human survival.
3. What are two criteria that allow a planet to be considered in the “habitable zone”?
4. What did the Chandra X-ray observatory gain direct proof of?
5. What was one of Spitzer Space Telescopes most notable discoveries?

A Threatening Space

What You Will Learn to Do

The universe is stunning in its beauty and variety. It is also an extremely perilous place. Not just to astronauts traveling from Earth, but to all of humanity, as well as the animals, plants, and insects populating our home world. In the next few pages, we'll introduce you to some of these dangers.

Skills and Knowledge You Will Gain Along the Way

- ✓ Appreciate the risks for astronauts venturing into deep space.
- ✓ Learn about a near, human-caused catastrophe within Earth's orbit, and one that may yet happen.
- ✓ Understand threats to humanity from outer space (not including aliens).



A large asteroid could cause an extinction-level event if it should enter the Earth's atmosphere. Courtesy of iStock, Credit dottedhippo

Risks to Human Body

Radiation is dangerous in large doses. Some radiation can be even lethal in small doses. Space exposes the human body to an increased health risk due to radiation. The International Space Station (ISS) orbits inside Earth's protective magnetic field, yet the occupants still receive ten times the dosage of radiation as on the ground. For trips to the moon, Mars, and beyond, the exposure is even higher. Developing lightweight radiation shielding and medicines to defend against radiation will be necessary for deep space travel and eventual colonization of the solar system.

Spending time in the weightless environment of space changes our physiology. Humans evolved within Earth's gravity. We are still learning about how species adapt to being in space through research being conducted aboard the ISS. Gravity on Mars is three-eighths that on Earth. More research will need to be completed before colonization of the Moon and Mars by settlers is realistic.

Radiation and lower gravity are not the only health factors to consider. While spacefarers are not likely to contract illnesses like the seasonal flu and colds, there is still a chance of becoming sick. The body and mind are still vulnerable.

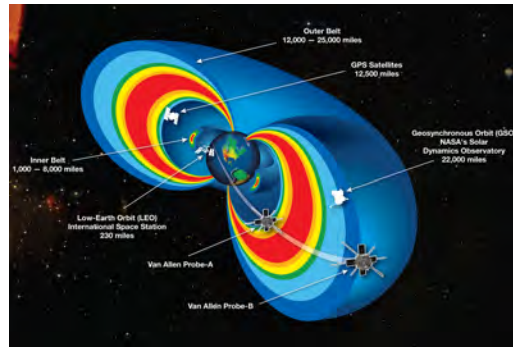
There are additional risks to the human body and mind with deep space travel and colonization:

- **Closed environment.** A spacecraft is a closed environment. Everything needed to sustain life must be carried with the vehicle. If a component breaks down, you can not call roadside service to come give you a tow. Backup systems, monitoring, maintenance, and a crew trained in multiple disciplines is important for any interplanetary journey. The crew will need to be able to function as doctors, engineers, mechanics, and more.
- **Distance.** As spacecraft hurl through the solar system and the distance increases, so does the time delay for back-and-forth communication with Earth. Depending on the orbital positions of the planets, it can take up to 20 minutes for a radio signal to travel between Earth and Mars. Crews will need to be able to respond to crisis on their own.
- **Isolation.** The isolation of being confined within a spacecraft for months at a time can lead to depression and behavioral issues. Distance will make communication with loved ones and friends difficult. The drudgery of being cooped up inside a small spaceship with no option to step outside and take a leisurely stroll in nature, is bound to affect the crew. The close quarters may lead to ill tempers and disagreements among crew members. While attempts will be made to select crew members who are psychologically compatible, anything can happen on such a long journey.

Van Allen Radiation Belts

The Van Allen Radiation Belts, a pair of donut-shaped belts of highly charged particles, lie within Earth's orbit. Discovered by Dr. James Van Allen soon after the launch of Explorer 1 in 1958, these radiation belts can be lethal to satellites and humans that spend too much time in them. Luckily the intensity of the radiation within the belts varies, and there is a gap region between the belts that provides a safe zone.

The inner belt generally occupies an area between 620 miles to 7,500 miles above the Earth. The ISS resides below the radiation belt at an altitude of 230 to 290 miles. The Hubble Space Telescope is placed in a slightly higher orbit at 340 miles.



Cutaway view of the Van Allen Radiation Belts. Courtesy of NASA

The outer belt typically extends from 8,400 to 36,000 miles above the planet; however, the most intense area of radiation resides between 9,000 and 12,000 miles.

At the farthest general reach of the outer belt lies geosynchronous orbit at an altitude of 22,240 miles.

Geosynchronous orbit is the orbital altitude at which a satellite stays parked above the same spot on the Earth on a permanent basis.

Medium Earth Orbit (MEO) is around 12,500 miles above the Earth. This distance places MEO within the gap region of the radiation belts. It also is the altitude at which Global Positioning System (GPS) satellites are positioned. The vast majority of satellites are placed in Low Earth Orbit (LEO), residing 1,200 miles or less above the planet, and safely below both radiation belts.

Medium Earth Orbit (MEO) is around

Starfish Prime

The discovery of the deadly Van Allen Radiation Belts left many wondering if space exploration would only lead to death. So, during the Cold War, the military launched nuclear missiles into the Van Allen Belts and detonated them to disrupt or eliminate the radiation. The American military program was called Operation Fishbowl. It led to unexpected consequences.

A missile called Starfish Prime denoted a 1.45 megaton weapon—more than 100 times as powerful as the nuclear bomb dropped on Hiroshima, Japan during World War II— at approximately 250 miles altitude. The explosion created an immense **Electromagnetic Pulse (EMP)**, disrupting electrical and telephone services in Hawaii nearly 1,000 miles away. The light created by the blast was visible from 2,000 miles away on the Fiji Islands. Rather than disrupt the inner radiation belt, the blast actually intensified the belt. Multiple satellites in orbit were damaged or rendered inoperative as the artificially created radiation belt in LEO lasted for months.

New Vocabulary

Electromagnetic Pulse (EMP)–

releases huge waves of electromagnetic energy, causing damaging power surges in any electronics within range

Orbital Debris

There are more than a million objects larger than 1 cm (0.4 in.) in orbit today traveling at an average of 22,000 miles per hour. While 1 cm may not seem like much of a threat, at that speed a simple paint fleck of that size can cause as much damage as a 550-pound object going down the highway at 60 mph. As the amount of space junk keeps increasing, the chance of debris colliding becomes more and more likely. The worst-case scenario is called the *Kessler Syndrome*, where a chain reaction of collisions generates so much new space debris that we can no longer place satellites in orbit or launch spacecraft into deep space.

Humanity has attempted more than 5,500 orbital launches during the first 60 years. As of January 1, 2021, a tad more than 11,000 satellites have been placed in orbit. More than 6,500 remain in orbit with less than 3,800 still active. The number of communication satellites being launched has been increasing exponentially thanks to new satellite broadband services such as SpaceX's Starlink.

Atmospheric drag will eventually bring all the low- and medium- level space debris down through the atmosphere, where most objects will burn up and disintegrate. However, that can take up to 2,000 years. Space junk in geostationary orbit is a trickier problem as it can stay in orbit indefinitely. The best solution might be to jettison it into deep space. Several nations are working on this quickly growing problem. Hopefully, our space exploration dreams will not be grounded by our own short-sighted littering of Earth's orbit.

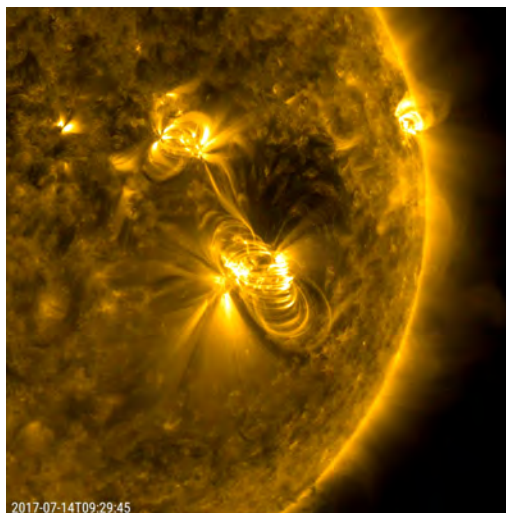
Solar Flares

Our sun whips up magnetic storms and spews streams of subatomic particles out into space. Known as a **solar flare**, these streams of energy went largely unnoticed for most of human history, except for the auroras created by them. Nowadays, they can disrupt our lives and cause millions of dollars in damage.

A solar flare struck Earth on the night of September 1, 1859, sending electricity surging through telegraph lines, stunning the operators, and setting fire to some of the telegraph equipment and offices. In March 1989, a much less intense solar storm knocked out an electricity grid in Canada for nine hours. Another solar flare, half as strong as the 1859 event, struck South Africa in October of 2003. It destroyed a dozen transformers, took out a large part of the country's power grid, and damaged a number of satellites.

The potential harm and disruption from a major solar flare event has become an even greater cause for concern as our society has become completely reliant upon electronics and satellite

communications in nearly every aspect of civilian, governmental, and military life. Monitoring systems in place will give us 15 to 20 minutes warning before a solar flare strikes the planet's upper atmosphere. It is hoped that there will be enough time to place satellites into safe mode, send astronauts to a shielded area of the space station, and to enable protection protocols for power stations and the electric grid here on Earth. The truth is though, as the intensity of the solar flare increases, damage in space and on the ground will occur.



A medium-sized solar flare on July 14, 2017. Courtesy of NASA/GSFC/Solar Dynamics Observatory

New Vocabulary

solar flare—
short eruption of intense radiation from the surface of the sun

Asteroid Impacts

The main **asteroid** belt lies in the region between the orbits of Mars and Jupiter. Unlike as depicted in movies, it is not a place where space rocks are in close proximity to one another and constantly colliding. The total mass of all the material in the main asteroid belt is estimated to be less than five percent of the mass of our moon. Occasionally though, an asteroid is thrown out of its orbit and careens through space. Sometimes, the gravitational pull of the sun and planets can interact to send it toward Earth. When an asteroid is large enough to survive a fiery freefall through the atmosphere, cataclysmic events can transpire. A lethal lesson the dinosaurs and other

New Vocabulary

asteroid—
a small rocky body generally in orbit around the sun

life on the planet learned when a 6.2-mile-wide asteroid struck off the coast of Mexico approximately 65 million years ago.

There have been had a number of close calls with large asteroids since then and an untold number that have impacted the Earth and left significant craters behind. NASA's Asteroid Terrestrial-Impact Last Alert System (ATLAS) scans the entire night sky once every 24 hours looking for space rocks that might one day threaten the planet. The agency is tracking nearly 30,000 near-Earth asteroids, as well as keeping an eye on the main asteroid belt for new asteroids breaking free. We now have hope for not only detecting a dangerous asteroid, but also of developing the means to nudge the asteroid safely away. Several space agencies are working on possible solutions.

Cosmic Killers

There are even more perils beyond our solar system that could bring a lethal end to all life on Earth. Some of these include supernovas, gamma-ray bursts, wondering stars, and black holes. On the bright side though, none are expected to occur within the foreseeable future.

Supernovas

Sometimes when a star has reached the end of its lifespan, it can self-destruct in an immensely powerful explosion known as a *supernova*. A supernova generates more than enough x-ray and gamma ray radiation to be lethal to life on any planet within 50 light years of the dying star. Luckily for us, these events are rare, and the closest star that might go supernova within the next million years, named Betelgeuse, is located more than 450 light years away.

Gamma-Ray Bursts



Gamma-ray bursts are the most powerful explosions ever observed in the universe. Courtesy of NASA/ESA, Credit M. Kommesser

Gamma rays are the most energetic of all the forms that light can take. At a universal scale, a gamma-ray burst can release more energy in just a few seconds than our sun will in its entire lifetime. Gamma-ray bursts are detected by scientists here on Earth every single day, but fortunately, all occurring outside of the Milky Way. The leading theory today is that these bright bursts occur from the collapse of a single massive star, or two smaller neutron stars, into a new **black hole**. The resulting gamma-ray burst is highly

focused into a set of narrow jets pointed in opposite directions. If a gamma-ray burst were to occur within 8,000 light years of Earth, and be pointed directly at Earth, the resulting radiation would deplete the **ozone layer** and increase the amount of ultraviolet radiation reaching the ground. Some scientists believe an extinction event that occurred on Earth 450 million years ago may have been caused by a gamma-ray burst.

New Vocabulary

black hole—
area of space where gravity is so strong that not even light can escape from it

ozone layer—
thin part of the Earth's atmosphere that absorbs almost all of the sun's harmful ultraviolet light

Wandering Stars

While you already know that the moon orbits the Earth and the Earth orbits the sun, but did you realize that the sun itself is in orbit around a supermassive black hole at the center of our Milky Way galaxy? As we traverse through one of the outer spiral arms of the galaxy, it is possible in the distant future that a wandering star might meander close to our solar system. The star could disrupt the **Oort Cloud** of ancient comets at the farthest reaches of the solar system and send them hurtling inward. **Astronomers** have discovered hints that this has already happened at least twice, once in the early days of the formation of the solar system, and then again as recently as 70,000 years ago.

Rogue Black Holes

It is believed that there is a black hole at the center of every galaxy in the universe. Supermassive black holes—such as the one at the center of the Milky Way—are capable of devouring entire stars. It was not until early 2022 that scientists were able to detect the first evidence of a previously theorized rogue black hole wandering among the galaxy. This solitary black hole is at a safe distance of 5,000 light years away; however, scientists expect to discover many more such objects in the years to come. If one were to pass too close to the solar system, it could disrupt the Oort Cloud, or even the orbits of the planets.

Conclusion

Space will always be a hostile environment to our species. The rapid increase of orbital debris may one day become a major obstacle to placing satellites into orbit and sending rockets into deep space. An immensely strong solar flare aimed at Earth could cause disruptions to everyday life that might last for days, months, or even years. The possibility of a large asteroid impacting the Earth as an extinction-level event will one day happen again, although the odds of it happening in your lifetime are extremely remote. Other cosmic killers could also end all life on Earth, however, the odds of that happening are even less likely within your lifetime. The universe is a dangerous place, and that will never change. While it is wise to understand the dangers, no matter how remote they might be, we must not stop exploring as there is so much yet to be learned.

Critical Thinking

1. With so many hazards inherent to space travel, consider why do we insist on continuing to send humans into space.
2. Assess how humanity's desire to explore would have changed had the Van Allen Radiation Belts been impossible to cross by either crewed or robotic spacecraft.
3. Analyze and come up with possible ways to reduce the amount of space trash in order to avoid the Kessler Syndrome from actually happening.
4. How would your life be affected by a solar flare that disrupted GPS and telecommunication satellites?

New Vocabulary

Oort Cloud—
a spherical cloud of mostly icy bodies located in the farthest reaches of the solar system
astronomers—
scientists who study planets, stars, and other celestial bodies

New Vocabulary

asteroid
astronomers
black hole
Electromagnetic Pulse (EMP)
Oort Cloud
ozone layer
solar flare

Study Guide Questions

1. What is the most powerful release of energy that we have discovered to date?
2. What does ATLAS stand for?
3. Where can black holes be found within the universe?
4. Have any “cosmic killers” caused an extinction-level event during Earth’s past?
5. What are three risks to the minds and bodies of astronauts when it comes to long-duration space travel?
6. The monitoring systems in place will give us how much warning before a solar flare strikes the planet’s upper atmosphere?

Defending the Final Frontier

What You Will Learn to Do

Heading into the new millennium, the United States had gained near total control of the ultimate high ground—outer space—from a military perspective. With the proliferation of new launch vehicles, advancing technologies, miniaturization, and the commercialization of space, that tactical dominance has slowly diminished. Other nations, such as China, have set their sights on space as well. Therefore, the U.S. military continues to invest in ways to monitor, maintain access to, control, and defend our assets in outer space from any outside interference.

Skills and Knowledge You Will Gain Along the Way

- ✓ Understand why hypersonic weapons are a new kind of missile threat.
- ✓ Learn about the two main types of antisatellite weapons.
- ✓ Gain an inkling of how the military monitors space for any threat, be it intentional or accidental.
- ✓ Discover how the U.S. will operate in a space warfare arena.
- ✓ Meet the newest branch of the U.S. military.



The U.S. Space Force was created to protect our existing assets in orbit and to maintain space superiority in case of an armed conflict. Courtesy of the U.S. Space Force, Credit Staff Sgt. James Richardson Jr.

Hypersonic Weapons

New Vocabulary

hypersonic—
pertaining to a speed that
is at least five times the
speed of sound

As the ability of systems to defend against Intercontinental Ballistic Missiles (ICBMs) has matured, a new competition has sprung up with several nations developing **hypersonic** weapons.

ICBMs have traditionally been launched vertically through the atmosphere before falling back to Earth to hit their target. While ICBMs will reach hypersonic speeds in excess of Mach 5 (about 3,800 mph), the missiles can be tracked and potentially intercepted during the free fall stage.

There are two classes of hypersonic weapons being developed, hypersonic boost-glide weapons and hypersonic cruise missiles. Both are predicted to be nearly impossible to target by current anti-missile defense systems. These weapons have been in development for a long time, but it may be decades yet until either is proven to be an effective weapon system.

Hypersonic Boost-Glide Weapons



Artist illustration of a hypersonic missile in flight after jettisoning its nose cone. Courtesy of Lockheed Martin

Hypersonic boost-glide weapons are launched much like an ICBM, in that they are launched on a rocket into space. However, instead of following a ballistic trajectory to its target, a hypersonic boost-glide missile is able to flatten its trajectory, as well as continue to make changes to its course as it speeds back through the atmosphere. Despite its name, a hypersonic boost-glide weapon will actually be slower than current ballistic weapons are. Its advantage is the inability of the enemy to predict its intended target and, therefore, can't launch effective countermeasures.

Hypersonic Cruise Missiles

A hypersonic cruise missile can also be launched from a rocket, but instead of heading into space, it uses a scramjet engine to soar through the atmosphere at theoretical speeds of up to Mach 25 (over 19,000 mph). With a scramjet, the forward speed of the aircraft compresses the intake air and sends it through the engine at supersonic

speeds, which ignites with the fuel. This differs from a rocket engine, which must carry its own liquid oxygen in tanks.

The hypersonic cruise missile's lower trajectory and maneuverable, super-fast engine allow it to rapidly approach its intended target. It is both hard to detect and nearly impossible to intercept and destroy due to its speed and low altitude.

Anti-satellite Weapons

Less than three years after the Soviets launched of Sputnik, the United States tested the first anti-satellite weapon. In a project called Bold Orion, an air-launched ballistic missile was fired at a target satellite from a B-47 bomber. The weapon failed to hit the satellite but did come close. A few years later, on May 24, 1963, the Nike Zeus anti-ballistic missile program, adapted under Project Mudflap, successfully intercepted an Agena-D rocket that was being used as a target.

The Soviets also were working on anti-satellite weapons (killer satellites) that could be launched into the same orbit as an enemy's satellite, approach it, and destroy it. They would continue the killer satellite program until the fall of the Soviet Union.

Both the Americans and the Soviets invested in smaller anti-satellite missiles that could be fired from a jet fighter. On September 13, 1985, an ASM-135 missile fired from a U.S. F-15 Eagle jet fighter intercepted and demolished the Solwind P78-1 satellite at an altitude of 345 miles.

Because blowing up satellites tends to create a lot of debris, there were no more anti-satellite missile tests for more than 20 years. That ended in January 2013 when China used a ballistic missile to target and destroy one of its own weather satellites, creating several thousand pieces of smaller debris. On March 27, 2019, India successfully sent a ballistic missile to intercept a small satellite orbiting at just 175 miles. The missile disintegrated the target, creating around 400 pieces of debris, most of which fell back to Earth within a few months.

Missiles and killer satellites aren't the only possible anti-satellite weapons. Research is ongoing into ways to disable satellites by using high-energy lasers, electromagnetic pulse weapons, and cyber hacking.



U.S. F-15 Eagle jet fighter fires an ASM-135 missile to destroy a satellite. Courtesy of USAF, Photo by Paul Reynolds

NORAD

The North American Aerospace Defense Command (NORAD) was formed as the result of a pact between the United States and Canada during the height of the Cold War in 1957. Initially NORAD was an integration of both nations' air defenses under a joint command structure to protect against a long-range Soviet attack. Since then, this command center has evolved to include defense and early warning against attacks by aircraft, missiles, and spacecraft.

For its first 50 years, NORAD was based at the Cheyenne Mountain Operations Center (CMOC), near Colorado Springs, Colorado. The bunker complex sits more than 1,500 feet underground and encompasses 15 buildings. In the aftermath of the 9/11 terrorist attacks, the main base of operations was moved to the nearby Peterson Air Force Base, with Cheyenne Mountain functioning as an alternate command center.

In addition to tracking everything within North American airspace 24 hours a day, 365 days a year, NORAD provides a very special function each year: tracking Santa Claus and his sleigh and providing updates on their location to children worldwide.

The tradition began in 1955 when a child dialed the unlisted number for the Continental Air Defense Command Operations Center, the precursor to NORAD, after seeing the number in a local newspaper ad. The number in the ad was a mistake, but Air Force Colonel Harry Shoup, the commander on duty that night, assured the child that the skies leading from the North Pole were clear and Santa was on his way.

Every year since, NORAD has had personnel and volunteers on duty each Christmas Eve. In recent years, a NORAD Tracks Santa website has been available, offering tracking updates and even videos of Santa and his sleigh soaring over cities all across the globe. The website receives nearly 15 million visitors, while volunteers answer more than 130,000 calls and emails each December.



Volunteers answer phone calls and emails from children requesting to know the whereabouts of Santa Claus. Courtesy of USAF, Photo by Staff Sgt. Alexandra Longfellow.

U.S. Space Force

The ability to protect our existing assets in orbit in case of an armed conflict has become a national security priority. With that in mind, the United States Space Force (USSF) was signed into law by President Donald J. Trump on December 20, 2019. It is the sixth independent branch of the U.S. military. The Space Force is organized under the U.S. Air Force, in much the same manner as the U.S. Marines are organized under the U.S. Navy. More than two dozen existing U.S. Army, Air Force, and Navy units have been realigned under the Space Force. The units folded into the new branch include launch and control facilities, weapon laboratories, satellite operation and defense, test facilities, and intelligence personnel with expertise in space operations and warfare.

USSF personnel are known as Guardians. There are less than 20,000 Guardians in service at this time, although that number is expected to increase as the new branch ramps up operations. The U.S. Space Force has inherited a fleet of more than 70 operational satellites, including the nation's Global Positioning System (GPS)

satellites. USSF also inherited two Boeing X-37B robotic spaceplanes that have conducted six orbital missions lasting between 223 and 779 days apiece.

U.S. Space Command

The United States Space Command's (SPACECOM) mission is to “conduct operations in, from, and through space to deter conflict, and if necessary, defeat aggression, deliver space combat power for the Joint/Combined force, and defend U.S. vital interests with allies and partners.”

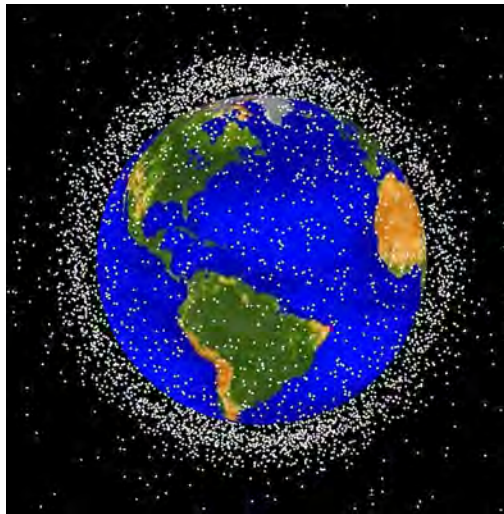
That covers a lot of territory. Essentially if warfare of any type were to occur in outer space, the U.S. Space Command would function as the command center for America's military response. Originally created in 1985, SPACECOM was dissolved in 2002, then returned as a full unified combatant command in 2019.

The commander of the U.S. Space Command reports directly to the Secretary of the Defense, who in turn reports directly to the President. It's the nation's war-fighting domain for all outer-space operations. It is able to draw personnel from the Army, Marines, Navy, Air Force, and Space Force as needed to accomplish its mission.

U.S. Space Surveillance Network

The United States has been keeping track of satellites since the launch of Sputnik 1, and the Department of Defense (DoD) has continuously maintained a database of the status of thousands of satellites, called the U.S. Space Catalog. The Space Surveillance Network (SNN) utilizes more than 30 ground-based radars and telescopes worldwide, plus six orbital satellites, to monitor any object larger than a softball in orbit. There are more than 27,000 pieces of space junk currently being tracked, with the number growing every year.

Considering the threat that space debris poses to operational satellites, space stations, and spacecraft, SPACECOM now provides Space Situational Awareness (SSA) tracking services to other space agencies and commercial space companies.



Artistic depiction of the space junk that encircles the Earth. Courtesy of NASA

Conclusion

The military's role in space exploration begins with protecting our orbital assets already in place, as well as assuring that we, and our allies, are able to continue to launch into space for communications and other purposes as needed. Technology being developed today will allow us to remove enemy satellites from orbit; however, doing so may create more risk to our own assets through the generation of space debris. Hypersonic missiles may one day allow us to quickly reach a target anywhere on the planet with little chance of the opposing force being able to ascertain the final

target or neutralize the weapon. In order to bring the nation's warfighting capability into space under one command, the U.S. Space Force was formed in late 2019. It works with NORAD, the U.S. Space Command, NASA, and other agencies, to monitor and maintain access to orbital space.

Critical Thinking

New Vocabulary

hypersonic

1. Given the advantage of maneuverability and speed that hypersonic weapons have, how long may it take before effective countermeasures are developed?
2. What interests do you have that you feel would make you a good recruit for the U.S. Space Force?
3. With the threat space debris poses, why develop anti-satellite weapons that destruct the satellite into many smaller pieces of debris?

Study Guide Questions

1. The U.S. Space Surveillance Network can track an object in orbit as small as what?
2. Are hypersonic weapons faster than an ICBM?
3. Which military organization is in charge of monitoring Santa's sleigh each Christmas Eve?
4. What is someone in the U.S. Space Force called?
5. NORAD was formed as the result of a pact between what two countries?
6. Which president created the United States Space Force (USSF)?
7. How fast is an aircraft traveling if it is traveling at Mach 5?

Benefiting All of Us

What You Will Learn to Do

Approximately one ten-thousandths of one percent of America's current population has traveled beyond the planet's atmosphere into space. However, nearly every single individual benefits daily from technology advancements that have trickled down from NASA's exploration missions. Research for space exploration has greatly influenced the advancements of everyday society that we take for granted. The technology has been incorporated into thousands of new products. A small selection of these spinoff products is featured in this chapter.

Skills and Knowledge You Will Gain Along the Way

- ✓ Learn about a small sampling of the thousands of spinoffs of NASA technology.
- ✓ Understand how your life benefits every day from these spinoffs.



Technology from the Apollo missions helped pave the way for modern microprocessors that power computers, automobiles, smartphones, and televisions. Courtesy of iStock, Credit Oatawa

Consumer Goods



U.S. astronaut Walter Cunningham writes with a Fisher Space Pen during the flight of Apollo 7. Courtesy of NASA

The subject of a long-circulating myth, the Fisher Space Pen has been used by astronauts on every mission since Apollo 7. The Space Pen is able to work in any position, including upside down, as well in extreme weather conditions and even in the vacuum of space. Each pressurized cartridge holds near-solid ink that liquefies from friction with the ball at the point of the pen. The pen remains popular to this day and more than a million are sold each year.

Here are some other consumer goods sold today that were developed for space:

- Memory foam, which was originally developed by NASA to improve seat cushioning for pilots. It is used in a variety of consumer products, including pillows and mattresses.
- The technology used in modern ski goggles, welder masks, and sunglasses to enhance colors, better filter out ultraviolet rays, and protect them from scratches, was originally developed in the 1980s for astronaut helmets.
- Battery-powered tools were developed by Black+Decker along with NASA for the lunar missions during the Apollo program. Cordless tools have since become a staple of every contractor's toolkit.
- The Apollo Guidance Computer was the first to make use of integrated circuits (IC), which helped pave the way to modern microprocessors that power computers, automobiles, smartphones, and televisions.

Energy and Environment



Aerogel, one of the lightest solid materials known, is also an excellent insulator. Courtesy of NASA

Here are some energy and environment products initially developed for space:

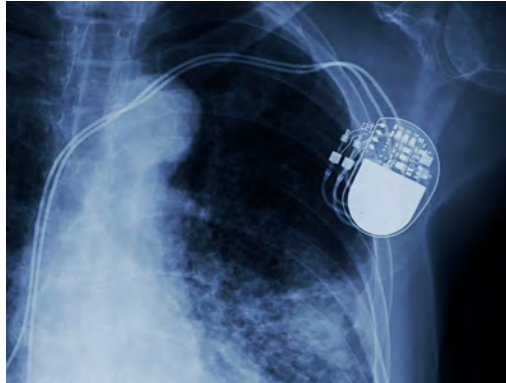
- Special light-emitting diode (LED) lights manufactured to illuminate NASA's rocket engine test fires have been retrofitted aboard U.S. Navy ships, leading to weight reductions and energy savings. Factories that have swapped out fluorescent lights for LED bulbs have seen a reduction in employee headaches too.
- An LED lighting system designed to allow plants to grow without direct sunlight aboard the International Space Station is also enabling food and other crops to be grown indoors here on Earth using vertical farms.

- Silica aerogel is a material that is incredibly lightweight and has the lowest conductivity of any known solid. NASA proposed developing a flexible aerogel to insulate liquid fuel storage for the space shuttle program. The product was continually refined and is now used as thin, lightweight insulation in products ranging from construction and appliances to winter jackets.

Health and Medicine

Here are some health and medicine-related technologies initially developed for space:

- Cardiac pacemakers originally suffered from needing to be surgically removed and implanted every few years when the battery ran out. With the help of NASA researchers, it became possible to use inductive charging (wireless power transfer) through a patient's skin, eliminating the need for multiple surgeries. Modern pacemakers are even smaller than before and able to be reprogrammed by doctors remotely.
- The recording and transmission of health monitoring data (telemetric) was originally developed during the Gemini program to allow NASA doctors to monitor astronauts' vitals during spaceflight. It is now standard practice in hospitals, and the technology is being adapted for home use allowing doctors to keep eyes on their patients.
- Studies of changes in astronauts' vision during long-duration spaceflight have led to advances that allow doctors to visualize cancer tumors in three-dimensions from a computerized tomography (CT) scan.
- A new way of working with Teflon™ led to the creation of ribbons of the material, which is compatible with living tissue and has found a new use as medical sutures within the human body.
- NASA's experience with protecting solar arrays in space from damage helped an Ohio-based company develop a sterilizing fog that can disinfect the interior of an ambulance in less than an hour.
- Quick modification of a NASA antigravity pressure suit in 1969 saved the life of a new mother suffering from postpartum hemorrhage (extreme bleeding after giving birth). Since then, a number of newly designed pressure garments have been deployed worldwide, reducing blood loss in new mothers by 50 percent.



X-ray image of permanent pacemakers implanted inside a patient's chest. Courtesy of iStock, Credit ChooChin

Industrial Productivity

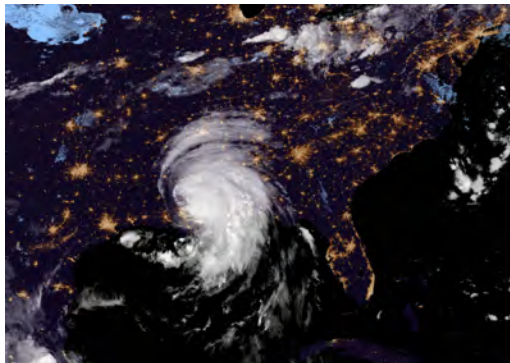


NASTRAN has been used to help design everything from airplanes and cars to Disney's Space Mountain roller coaster. Courtesy of iStock, Credit AntonBalazh

Here are some industrial technologies initially developed for space:

- Metallic glass coatings, also known as *liquid metal* were developed by NASA's Jet Propulsion Laboratory (JPL). Such coatings can protect spacecraft components to reduce wear and tear. On Earth, the durable coatings have been adopted in power plants and oil rigs, extending the lifespan of parts, and nearly eliminating unexpected failures of the coated parts.
- Fracture-toughness tests made certain that the metal used in spacecraft was of the highest quality. Manufacturers of larger tractors and plows use fracture-toughness tests to reduce breakage when farmers work in fields containing rocks. Electrical utilities use the test to inspect for flaws in materials used to build new power plants.
- The NASA Structural Analysis (NASTRAN) computer program was developed to help engineers create more efficient spacecraft. The program increased the speed and reliability of predictions of how components of an object will behave under stress. It has been adapted and widely used for designing automotive parts, bridges, skyscrapers, aircraft, railroads, power plants, and even Disney's Space Mountain roller coaster.

Information Technology



Weather satellites track Tropical Storm Ida's path. Courtesy of NASA

Here are some information technology products initially developed for space:

- Techniques developed by NASA to train astronauts on making repairs on the International Space Station have trickled down into augmented reality systems here on Earth to provide virtual assistance to workers.
- Ultra-fast, unhackable, and secure transmission of data between hospitals, banks, and other entities is being made possible using laser communications. This is a refinement of technology used by NASA to increase bandwidth of data being sent from space to Earth.
- Weather satellites and faster computers have allowed weather forecasting to improve exponentially during the past 50 years. The National Oceanic and Atmospheric Administration (NOAA) and NASA have worked together to design, construct, and launch a fleet of weather monitoring satellites. NASA has also created scheduling software to download and process each satellite's data in the

best manner, giving meteorologists more time to analyze and forecast potentially dangerous weather.

Public Safety

Here are public safety items initially developed for space:

- The Satellite Aided Tracking (SARSAT) system was created under the leadership of NASA. The system is able to detect distress signals from emergency beacons. It has led to the rescue of nearly 50,000 people worldwide.
- Lost mariners are more easily found when wearing life preservers, or insides of life rafts, that contain radar reflective materials developed by NASA in 1959.
- Explosives used to separate the stages of the Gemini rockets have become a tool in the arsenal of firefighters and rescue personnel. The small charges are able to cut holes in walls to vent smoke and to gain access to search for victims.
- Firefighters also have benefited from spacesuit technology. Lighter-weight, higher-pressure air tanks that hold much more oxygen, as well as redesigned facemasks and regulators, have made it easier for them to perform their jobs.
- Finding people trapped under rubble after an earthquake or other disaster has become easier thanks to expertise gained by NASA. Weak radio signals were analyzed by NASA to detect slight gravity fluctuations in a satellite's orbits around the Earth. FEMA has worked with NASA engineers to refine the applicable software and hardware into a suitcase-sized device called FINDER that can be deployed onsite and detect a human heartbeat through as much as 30 feet of rubble.



The suitcase-sized FINDER can locate surviving victims buried under feet of rubble in disaster areas. Courtesy of NASA/JPL-Caltech/DHS

Transportation

Here are transportation products initially developed for space:

- The Global Positioning System (GPS) is a constellation of satellites launched by the U.S. Air Force. What began as a military program has since become one of the most vital communication infrastructures in the entire world. Evolutions of the system over the years have led to positioning system data being accurate to within less than three inches. That level of accuracy is opening the way for self-driving cars and farming tractors, as well as making it safer for smaller airplanes to land at airports in low visibility.
- An aerodynamics test program at NASA's Dryden Flight Research Center proved that placing upturned tips on aircraft wings reduced drag by nearly 20 percent. These *winglets* are now utilized by every major airline, saving them billions of dollars in fuel costs.
- Since 2008, all new cars sold in the U.S. have been required to have a tire-pressure monitoring system (TPMS). The earliest version of the tiny sensors for each of a vehicle's tires was created for the Space Shuttle program.

- Autonomous descent vehicles are the future of landing on the moon and Mars. Global flash lidar (Light Detection and Ranging) makes it possible for the spacecraft to scan the surface and make a landing site decision in real time. This technology also has found a place in the race to develop autonomous vehicles here on Earth.



Artist illustration of a GPS satellite in orbit as it provides positional data to devices and humans on the Earth. Courtesy of NASA

Conclusion

Taxpayer dollars invested into space exploration do not simply disappear into the cosmos. The technologies and expertise developed for the space agency's missions often trickle down into new consumer products, medical advances, transportation innovations, and more that benefit all of humanity every single day.

Critical Thinking

1. Since 1976, NASA has produced a publication on an annual basis, titled *Spinoff*, that highlights space technologies that corporations have turned into products and services. Use the internet to visit NASA's Spinoff website and discover more ways that your daily life is affected by technologies originally developed for space exploration.
2. Imagine how different your life would be if the space race had not occurred and driven forward the rapid advancement of computer technology.
3. Do you think investing in NASA research is good for the country's economic future? Why?

Study Guide Questions

1. What are at least two technologies included in modern cellphones that are derived from space spinoffs?
2. What are five products you use regularly that contain space technology?
3. Tire-pressure monitoring systems were originally developed for which spacecraft?

4. What new capabilities might be possible now that GPS data is accurate to within inches?
5. How was a modified NASA pressure suit used to save the life of a new mother?
6. What is the estimated return in new revenue to the American economy for each tax dollar invested into NASA?

Careers in Space and Beyond

What You Will Learn to Do

The field of space and everything that encompasses is a fast-evolving field. It may even be the ultimate growth industry. We are quickly approaching the true space age. One where access to space becomes common, and entire economies are built around such ventures. The logistics of outer space missions require a large team of workers with as varied a set of skills that are as endless as your imagination.

What has set humanity apart is our ability to accumulate information and pass it down to future generations. Building upon the successes and failures of those before us allows us to keep moving ever forward. Billions of minds will advance our civilization out into the cosmos. One of them can be yours.

Skills and Knowledge You Will Gain Along the Way

- ✓ Appreciate the vast variety and opportunities there are for careers in space.
- ✓ Understand the training and educational paths for a career in space.
- ✓ Identify and appreciate the importance of entrepreneurship and private sector opportunities.
- ✓ Identify the Navy enlisted and officer career fields in space.
- ✓ Identify employment opportunities within the federal, state, and local governments.



There are a vast variety of options for careers in space. Courtesy of iStock, Credit gorodenkoff

Overview

The first careers in space exploration often involved Navy personnel. Whether it be as one of the first selection of astronauts, including the Navy's Alan Shepard (the first American in space) or the recovery teams that retrieved the astronauts out of the ocean. As we move forward into private-sector space exploration, the career possibilities are expanding exponentially. Currently there are job opportunities available for almost every discipline one can imagine. From technology, satellites, **robotics** and mechanical engineers to travel, biologists, **meteorologists**, and machinists. There are even openings for psychologists, accountants, human resource officers, and thousands of other career opportunities.

If you have dreams of building an interplanetary probe that studies the icy surface of Jupiter's moon, Europa, or if you want to pilot a spacecraft bound for Mars, there will be opportunities. If you want to create a program that will recalibrate clocks between the Earth and spacecraft off planet, someone will be looking for just such a programmer. If you love space and also love cooking, you may realize an opportunity to put the two together to help create better meals for space travelers. No matter what your dream may be, there are jobs out there for you.

New Vocabulary

robotics—
branch of computer science and engineering involving the design, construction, operation, and use of robots

meteorologists—
profession concerned with the processes and phenomena of the atmosphere and weather

Education Paths and Qualifications

The U.S. Naval Academy has graduated more astronauts than any undergraduate institution within the military services. With that being said, the path to working in space is as vast as the opportunities themselves. If looking to get into a specific field, do some research, as it will affect what sort of education you pursue. One advantage that you will get with the Navy is that you will be trained in your specialty, as well as gain valuable experience in other fields. This sort of experience is also very desirable in the private sector.



Note

STEM degrees are highly sought after for many of the careers available. STEM stands for Science, Technology, Engineering, and Mathematics.

Educational Paths

While **master's** and **doctorate** degrees are always coveted, they are not the only path forward when it comes to the abundance of careers in space outside of STEM. The experience one garners while serving in the Navy is also a great steppingstone to future careers in the private and governmental sectors. Below, we will list some of the possible educational paths and degrees.

- There are many four-year bachelor's degrees that will get you in the door. A Bachelor's in Atmospheric Science might seem like it would have little to do with space, but those that choose to specialize in such a field are often tasked with predicting and modeling weather in space. About 26 percent of the atmospheric scientists in the U.S. work for the federal government. More and more, private companies are starting to employ them too. There are also opportunities for those with a two-year associate's degree in meteorology from a technical or community college.
- There are many engineering jobs, but there are also careers in computer science engineering. A Bachelor's in Computer Engineering is highly valuable and flexible in a world that requires computers in constantly changing ways. Including the robotic and autonomous operation of satellites, rockets, and rovers, as well as in

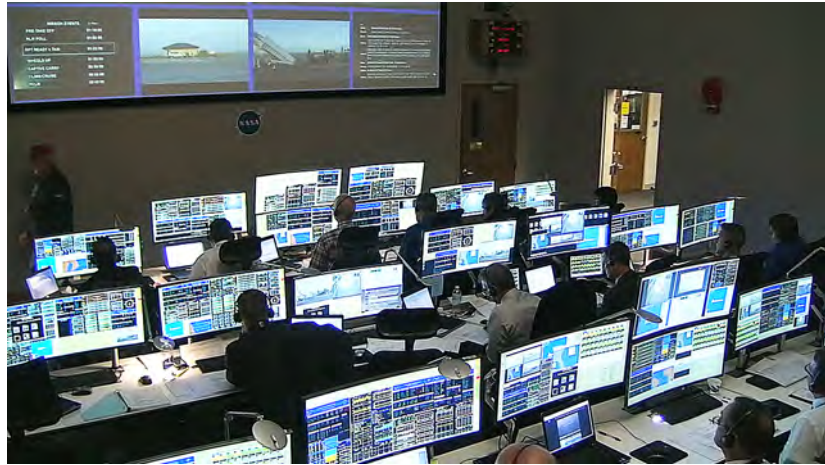
New Vocabulary

master's—
an advanced degree in a specific field beyond a bachelor's degree

doctorate—
usually the most advanced degree one can receive in a specific field, allowing the holder to teach at a university or work at the highest levels of the discipline

manned vehicles. There is a vast array of hardware and software that has to be created and managed to operate and monitor all these endeavors from Earth.

- Even a degree in communications can come in handy. NASA, Boeing, Blue Origin, and a multitude of other companies need skilled media and communications professionals in the roles of public relations and technical writers. Public relations representatives interact with the news media and the community in general terms, announcing achievements and building excitement for future ventures. Technical writers often need to have a thorough knowledge of the field so that they can create necessary documentation and manuals.



Engineers working at the Launch Control Center at Cape Canaveral, Florida. Courtesy of NASA

Qualifications

Many occupations in the field of space will require some sort of degree at the entry level; however, it doesn't mean they all require one. Having a strong background in STEM is recommended and would likely be something you might pursue naturally because of your interest in space. Since space is such a dynamic industry, there are no hardline standards. Here are some examples of qualifications required for specific careers:

- **RF Engineer, Life Cycle Avionics.** Bachelor's degree in electrical engineering, computer engineering or physics. 1+ years of experience with electronic components, environments testing or RF systems. 1+ years of experience with **Matlab**, **LabVIEW**, and/or **SQL**.
- **Recovery Operations Engineer.** Bachelor's degree in an engineering or science discipline. 1+ years of experience developing and/or processing marine systems. (This is the type of job that Naval experience and a bachelor's degree would immediately get you in the door and working up the ladder.)
- **Jr. Robotics Engineer – JPL.** Bachelor of Science in Mechanical or Electrical Engineering plus 0–2 years of experience. Hands-on experience in design, as well as fabrication. (Again, this is a career the Navy can help get you that experience and qualify you for many exciting opportunities.)

New Vocabulary

Matlab–
program and numeric
computing platform used
to analyze data
LabVIEW–
computing platform for
visual programming
language
SQL–
Structured Query
Language, a domain-
specific language used in
programming and for
managing database
management systems

Navy Enlisted and Officer Opportunities		
Meteorology/Oceanography (AG)	Collect, record, and analyze weather and oceanographic information. Prepare weather forecasts and support operations by aircraft, ships, and shore commands.	Training includes the science of meteorology and physical oceanography.
Information Systems Technology (IT)	Monitor the radio frequency communication systems and manage and operate the Navy's communications operations and computer networks. Perform network system administration, install applications, and write computer programs. Service at sea includes surface ships and submarines. Ashore, ITs can be found at almost every Navy installation and joint command.	Training includes software and hardware fundamentals, systems theory, and automatic data processing. Training leads to credentials in IT and network support, web development, and computer security.
Aviation Structural Mechanic (AM)	Maintain all aircraft main and auxiliary power systems, actuating subsystems, and landing gear. Responsible for maintenance on the aircraft fuselage (main frame), wings, airfoils, and flight controls.	Training includes a nine-week course. AM's may also serve as flight engineers aboard certain aircraft.

Private Sector and Non-Profit Opportunities

There are many opportunities to be found in the private and non-profit sectors.

Private Sector

More private companies are getting involved in space travel, and the private sector has an ever-increasing demand for qualified employees in a variety of fields. Companies such as SpaceX, Virgin Galactic, and Blue Origin are just a few. These companies have helped to create an entire subcategory of businesses. Every job you can imagine is available:

- **Mechanical Engineers.** The world of space needs every type of engineer. **Avionics** engineers and technicians. Rocket and satellite engineers. Deployment and landing systems engineers. Recovery platform engineers and more. These are just some of the mechanical engineering jobs available.

New Vocabulary

avionics—
electronic systems and equipment specifically designed for use in aviation

- **Software Engineers.** Embedded software engineers are creating systems that operate the safety and communications systems between orbital and terrestrial platforms. Web designers are creating applications that help all departments. There are also Cyber Security and encryption positions.
- **Scientists and Researchers.** Astronomers, astrophysicists, mathematicians, chemists, and biologists are all vitally important to space exploration and colonization. Without theorists, we never would have launched our first rocket or learned how to communicate using electronic signals. Science is a never-ending pursuit for information and problem solving.
- **Communications and Human Resources.** There a myriad of positions in journalism, television, streaming, producing, filming, and communicating to the public. Human resources, recruiters, cooks, accountants, tax analysts, security, and custodial personnel are all part of a company like SpaceX.

The availability of jobs in the world of space is vast. A simple look at the open positions database at a company like SpaceX will show that. These companies are employing large numbers of engineers, web developers, security officers, cooks, and payroll analysts. There are also jobs that correlate with a life in the Navy, including Marine Engineers, Naval Architects, and Port Engineers.

The private sector opportunities were much more limited as recently as a decade ago. Now, the future looks to be with private and governmental cooperative missions. All these institutions will have their job openings posted on their websites with thorough breakdowns of qualifications and skills needed for the positions. You should research some of them to get an idea of what might interest you as a career path. You can then take a deeper dive into the educational paths you can start pursuing to better prepare you.

Non-Profit

Non-profit opportunities are less numerous than in the private and governmental sectors, but they do still exist. Often in the form of communications, information websites, magazines, podcasts, and even museums and teaching. Museum curators and teachers provide valuable inspiration to future generations of space explorers. Many of the podcasts and online publications that help advance interest and information about space exploration are sponsored by non-profit organizations. You might want to help curate and shape the international laws that all nations abide by in space, known as *Space Law*. While there are existing accords and treaties, space is still a new field that will require new laws and rules to help govern. Multiple organizations are working on setting those rules, such as the **MILAMOS Project** and the McGill Encyclopedia of International Space Law.

Conclusion

The United States is home to the leading companies in space travel. While large hubs of the industry exist in California, Texas, and Florida, there are many other places all over the world that house spaceports or research and fabrication facilities. Any degree or training can be useful in the pursuit of a career in space. Specialized degrees are often required for entry, but training and experience are also important. If you want to be a scientist, astronaut, or engineer, there are a myriad of jobs available to you in the field. If you love space and just want to talk about it and encourage others to love it, or if you just want to support the industry while not being a scientist, there are thousands of other jobs available. With more being created nearly every day.

The Navy has many technical positions within its ranks that can help prepare you for private sector or governmental jobs. The Navy provides valuable hands-on experience

New Vocabulary

MILAMOS Project—*Manual on International Law Applicable to Military Uses of Outer Space*, aims to develop a manual clarifying the limitations international law places on the threat or use of force in outer space

that is highly sought after when dealing with exploration, and the challenges that come with it, into new frontiers.

With such a new and expanding industry, if a career doesn't currently exist that you would want, then there is opportunity for you to create it. The future is for the dreamers. The world will always need more of those.

Critical Thinking

1. Research the qualifications to become a Marine Engineer in the private sector. How would becoming a Navy Aviation Structural Mechanic benefit one in the pursuit of a private sector job? What duties would be similar?
2. Identify a leading private company that you would like to work for. Research their current job openings and qualifications required for jobs that interest you.
3. Identify government jobs that are involved in the field of space, whether it be through NASA, Space Force, the Navy, or other federal or local governmental agencies.

New Vocabulary

avionics
doctorate
LabVIEW
master's
Matlab
meteorologist
MILAMOS Project
robotics
SQL

Study Guide Questions

1. What undergraduate military institution has graduated more astronauts than any other?
2. Who was the first Naval Academy graduate to become an astronaut?
3. What are the names of two private space travel companies that work jointly with NASA?
4. How can one garner work experience in the Navy to help qualify them for space-related careers?
5. What are three careers in the space program that do not require you to be an engineer or an astronaut?

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Glossary

401(k)– a retirement account offered through employers

advancement exam– one of the key factors in determining an enlisted Sailor's ability to be promoted

algorithm– a set of instructions for problem solving. Algorithms are at the root of computer science

amphibious ship– a naval ship which is designed for long sea voyages and for rapid unloading over and on to a beach

apartheid– in South Africa, a policy or system of segregation or discrimination on grounds of race. Gender apartheid is also a thing, situation, and issue

Apollo program– NASA's moon exploration program

apprenticeship– opportunity to learn a trade, art, or job while working under an established professional

apprised– informed or to tell others

APR; annual percentage rate– the yearly rate charged for a loan

aptitudes– skills that you are naturally good at

acquitted– free (someone) from a criminal charge by verdict of not guilty

ardent– enthusiastic or passionate

Armed Services Vocational Aptitude Battery (ASVAB) – a test administered by the U.S. Military upon enlistment to determine qualification and a scoring system

articulation degree– a relationship between a community college and a four-year college or university that allows students in good standing to automatically transfer after earning their associate's degree

asset– property owned by a person (or company), regarded as having value, with the expectation that it will provide a future benefit

associate's degree– an undergraduate degree awarded after two years of study

asteroid– a small rocky body generally in orbit around the sun

astronomers– scientists who study planets, stars, and other celestial bodies. Some astronomers study distant galaxies and phenomena such as black holes and neutron stars.

Astronomical Search for Origins– is a decades-long study addressing the origins of the universe, various astronomical bodies, and life
Astronomical Search for Origins (ASO) ASO

attribute– assigning responsibility or blame for an action

authoritarian– is a form of government that is highly centralized and rejects the importance of popular support

Automated Transfer Vehicle– is an unpiloted cargo carrier designed to supply the International Space Station with liquid and dry cargo and gases. Once the supplies are removed, the ATV becomes a garbage container, which, with the spacecraft, are incinerated on re-entry into the Earth's atmosphere. Automated Transfer Vehicle (ATV) ATV

autonomy– the quality or state of being self-governing, being moral, and personal independence

avionics– a category of electronic systems and equipment specifically designed for use in aviation

bachelor's degree– a four-year college degree

ballistic missile– a rocket-powered object that after engine shutdown continues on an unpowered, parabola-like trajectory

ballistic trajectory– the path of an unpowered object, as a missile, moving only under the influence of gravity with its surface providing no significant lift to alter the course of flight

battlespace awareness– ability to understand the operational environment to inform national and military decision making. Includes intelligence, surveillance, reconnaissance (ISR), meteorology, and oceanographic information.

beneficiary– the person (or persons) who will receive the benefit when you pass away

black hole– an area of space where gravity is so strong that not even light can escape from it

bottom line– often referred to in financial dealings this is the company's income after deducting all expenses from income. In a military sense this translates to the readiness of the unit, trust in their leaders, and level of morale.

- brig**– a naval military prison on a ship or navy base
- candor**– unreserved, honest, or sincere expression
- censorship**– government suppression of free speech or other forms of communication
- chain of command**– hierarchy of reporting relationships from the bottom to the top of an organization; who must answer to whom
- Chairman of the Joint Chiefs of Staff**– the principal military advisor to the President, Secretary of Defense and the National Security Council (NSC)
- Chief of Naval Operations**– the senior military officer of the Department of the Navy. The CNO is a four-star admiral responsible for the command, utilization of resources, and operating efficiency of the shore activities and operating forces of the Navy assigned by the Secretary. A member of the Joint Chiefs of Staff, the CNO is the principal naval adviser to the President and to the Secretary of the Navy on the conduct of war, and is the principal adviser and naval executive to the Secretary on the conduct of activities of the Department of the Navy Chief of Naval Operations (CNO) CNO
- closing costs**– expenses involved for the paperwork and process to officially take ownership of your new home
- cloud**– data storage offered off-site from where the users are
- co-op**– a structured method of combining classroom-based education with practical work experience and provides academic credit for that structured job experience
- coalesce**– come together to form one mass or whole
- cognizant**– have knowledge or being aware of
- collateral damage**– injury inflicted on something other than an intended target
- combatant commanders**– the Defense Department has 11 combatant commands, each with a geographic or functional mission. All are four star admirals or generals.
- Command Module**– spacecraft that contained the crew quarters and flight control section. Together with the Service Module, they were referred to as the CSM or Command and Service Modules.
- Commandant of the Marine Corps**– normally the highest-ranking officer in the United States Marine Corps, a four star general and a member of the Joint Chiefs of Staff
- consensus**– a general agreement
- constructive criticism**– a helpful way of giving feedback that provides specific, actionable suggestions
- copay**– a flat fee that you pay on the spot each time you go to your doctor or fill a prescription
- core values**– the deeply ingrained principles that guide all of a company's actions; cultural cornerstones
- cosmonauts**– Soviet or Russian astronauts
- cost of attendance**– tuition, room, and board, as well as averages for fees, books, supplies, transportation, and personal expenses cost of attendance (COA) COA
- court-martial**– a legal proceeding for military members that is similar to a civilian court trial. It is usually reserved for serious criminal offenses like felonies. For less serious criminal offenses or breaches of military decorum and regulations, a Non-Judicial Punishment (NJP) is usually held.
- Crew Dragon**– a partially reusable spacecraft developed and manufactured by American aerospace manufacturer SpaceX, primarily for flights capable of ferrying up to seven crew to the International Space Station (ISS)
- cryptology**– study of ways to secure communications
- cyanobacteria**– also called blue-green algae, are microscopic organisms found naturally in all types of water
- cyberbullying**– sending, posting, or sharing negative, harmful, false, or mean content about someone else
- cybersecurity**– the protection of data on computers from theft (loss of confidentiality), manipulation (integrity), while remaining available, summarized by the acronym CIA
- cyberspace**– the vast network of interconnected computers that span the globe, equipment attached to the network, and the information that traverses and is stored in it
- cyberspace operations**– the employment of cyberspace capabilities where the primary purpose is to achieve objectives in or through cyberspace

cynicism– an inclination to believe that people are motivated purely by self-interest; skepticism

dark matter– is material that cannot be seen directly, it is composed of particles that do not absorb, reflect, or emit light, so they cannot be detected by observing electromagnetic radiation

debt to income ratio– compares how much you owe each month to how much you earn debt-to-income ratio (DTI) DTI

demoralizing– causing someone to lose confidence or hope

department– one of many key organization onboard a ship reporting directly to the commanding officer and administratively to the executive officer. Examples include: Deck, Weapons, Engineering, Ops, Navigation and Supply Departments.

dependents– in practical terms, it's someone who literally "depends" on the taxpayer for support. Some examples of dependents include a qualifying child, stepchild, brother, sister, or parent. The taxpayer's spouse cannot be claimed as a dependent.

deployment schedule– advanced notice of time away from normal duty station.

dereliction of duty– deliberate or accidental failure to do what you should do as part of your job; willfully refused to perform your duties or follow a given order

direct deposit– the electronic transfer of a payment directly into your account

discretionary spending– non-necessary, optional spending rather than spending on necessary expenses (within the federal budget it is subject to annual approval).

diversification– the act of investing in a variety of different industries, areas, and financial instruments

division– group reporting to a department head. For example, Supply divisions are numbered S-1 to S6. O or Ops, D for Deck, W for Weapons, E for Engineering and N for Navigation.

doctorate– usually the most advanced degree one can receive in a specific field, allowing the holder to teach at a university level or work at the highest levels of the discipline

dusty disks– the disks of gas, dust, and debris that surround young stars and are prime targets for research, as they are believed to be regions in which planets may be forming

earned income– wages, commissions, bonuses earned from working. A few of the items that are not earned income include investment interest and dividends, pensions and annuities, social security, and unemployment compensation.

economic espionage– a foreign effort to influence economic policy decisions or steal financial, trade, or economic policy information from the U.S. government or U.S. corporations, organizations, and persons

election interference– foreign efforts to affect an election's outcomes by targeting candidates, political parties, voter, or political processes

electromagnetic spectrum– the range of wavelengths or frequencies of electromagnetic radiation. It includes gamma, x-ray, ultraviolet, visible light, infrared, microwave, and radio waves. Electromagnetic transmissions are now used to connect devices wirelessly for local and global communication and its allocation is managed by the federal government

emaciated– abnormally thin or weak

Electromagnetic Pulse – releases huge waves of electromagnetic energy, which can act like a giant moving magnet which can cause damaging power surges in any electronics within range
Electromagnetic Pulse (EMP) EMP

encryption– the process for encoding information to prevent unauthorized access

end state– the final outcome at the successful completion of a military operation

escrow– a legal arrangement in which a third party temporarily holds sums of money in a separate account until needed. There are essentially two types of escrow accounts. One is used throughout the homebuying process until you close on the home. The other is used by your mortgage provider to manage property tax and insurance premium payments on your behalf.

espionage– spying or using spies, typically by governments, to obtain political and military information

exempt– free from an obligation or liability imposed on others

- face value**– the amount paid to the bond holder at maturity
- fair-market value**– dollar amount determined, based on the estimated amount a buyer and seller would likely agree upon under normal conditions
- fires**– attack capabilities of forces that includes use of cyberattack
- flag officer**– admirals or generals
- "foot stomp"**– a way to highlight important information
- Fortune 50**– a ranking of the global companies that show the best prospects for sustained, long-term growth. Being on this list is a big deal for business.
- Fra Mauro highlands**– a formation on the near side of Earth's moon that served as the landing site for the American Apollo 14 mission in 1971. It is named after the 80-kilometer-diameter crater, Fra Mauro, located within it.
- Galilean moons**– are the planet Jupiter's four largest moons, or satellites, named after Italian astronomer Galileo Galilei, who observed them in 1610. They are named Io, Europa, Ganymede, and Callisto.
- gamma ray**– electromagnetic radiation of the shortest wavelength and highest energy
- Gateway lunar outpost**– a multi-purpose outpost orbiting the Moon that provides essential support for long-term human return to the lunar surface and serves as a staging point for deep space exploration.
- Gemini program**– NASA's second human spaceflight program, and the first with more than one astronaut onboard
- General Education Development**– a group of four subject tests that indicate you have a high-school level of education General Education Development (GED) GED
- geo-political situation**– study of the influence of such factors as geography, economics, and demography in assessing foreign policy of a state/government at a point in time, while balancing the many demands and crises across the globe
- geosynchronous**– an orbit approximately 22,000 miles above the earth. Satellites placed here have the effect of being at a fixed location since the orbit matches the earth's rotation
- geosynchronous orbit**– a high Earth orbit (located at 22,236 miles above Earth's equator) that allows satellites to match Earth's rotation
- goals and vision**– vision is a clear image how you see your future...goals are set as a specific target that move you toward your vision
- grace period**– the amount of time before interest starts accumulating on charged purchases
- Great Filter**– a term coined by Robin Hanson in 1996 that gives possible reasons for why we haven't detected life beyond Earth
- Great Observatories**– series of four space-borne observatories, launched by NASA, designed to conduct astronomical studies over many different wavelengths (visible, gamma rays, X-rays, and infrared)
- gross pay**– the amount you make before taxes or other deductions are taken out
- guided missile destroyers**– surface ships that are capable of working independently or with strike force units and are capable of engaging targets on, above or, below the surface. Often referred as DDG-51 destroyers.
- gyroscope**– device containing a rapidly spinning wheel or circulating beam of light that is used to detect the deviation of an object from its desired orientation
- habitable**– the ability of a space to support life
- hazing**– humiliating and sometimes dangerous initiation rituals to single out individuals
- helmsman**– person who steers a ship, sailboat, submarine, or other type of maritime vessel
- hypersonic**– pertaining to a speed that is at least five times the speed of sound
- impetus**– the force that makes something happen or happen more quickly
- indictment**– a formal legal charge brought against an individual or organization
- information warfare**– the integrated employment of Navy's information-based capabilities (communications, networks, intelligence, oceanography, meteorology, cryptology, electronic warfare, cyberspace operations, and space) to degrade, deny, deceive, or destroy an enemy's information environment or to enhance the effectiveness of friendly operations.

- insidious**– proceeding in a gradual, subtle way, but with harmful effects
- internet**– an electronic communications network that connects computer networks around the world
- internship**– work in an organization, sometimes without pay, to gain experience or satisfy requirements for a qualification
- interstellar space**– the region of space between star systems within a galaxy
- International Space Station**– space station built and supported by 15 nations, including America and Russia in an ongoing cooperative effort to study a number of scientific fields
- itemized deductions**– are expenses that can be subtracted from adjusted gross income to reduce the amount of taxes you owe. Allowable itemized deductions include mortgage interest, charitable gifts, and unreimbursed medical expenses.
- iteration**– synonym of emphasis or repetition/version
- joint**– activities, operations, or organizations in which two or more military departments participate
- junior officer**– ranks from ensign to lieutenant
- junk**– a Chinese boat
- kudos**– praise and honor received for an achievement (congratulations)
- LabVIEW**– program alternative to Matlab, also computing platform for visual programming language
- leave**– permission to be away from one's unit. You never want to be AWOL (absent without leave). Liberty is the term used for absence up to a period of 96 hours. Military members earn 30 days of leave per year.
- lee helmsmen**– assistant or relief helmsman; usually operates engine order telegraph (which sends mechanical or electronic signals to the engineers below to adjust speed)
- letter of reprimand**– a U.S. Department of Defense procedure involving a letter to a service member from their superior that details the wrongful actions of the person and the punishment that can be expected
- liable, liability**– the state of being legally responsible for something
- light year**– the distance light travels in one year. Light zips through interstellar space at 186,000 miles per second which adds up to 5.88 trillion miles per year. If we were a space shuttle that travelled five miles per second, it would take about 37,200 human years to travel one light year.
- liquidity**– the ease at which an asset, or security, can be converted into cash
- litmus test**– a test in which a single factor (such as an attitude, event, or fact) is decisive. A question which reveals the true measure of one's ethics, morals, honesty, and/or honor.
- Lunar Rover Vehicle**– electric vehicle that the astronauts drove on the surface of the moon Lunar Rover Vehicle (LRV) LRV
- magnitude**– magnitude is the most common measure of an earthquake's size. It is a measure of the energy released at the source and is measured on a scale from 2.0 to 8.0.
- master's**– an advanced degree awarded by universities to students who further advance their education in a specific field beyond a bachelor's degree. Typically takes 1-2 years of additional study.
- material readiness**– the availability of material required by a military organization to support its wartime activities or contingencies in a well maintained, safe and effective manor
- Matlab**– program and numeric computing platform used by engineers and scientists to analyze data
- maturity**– the date when an investment, such as a certificate of deposit or bond, becomes due and is repaid to the investor along with accumulated interest
- measles**– a very contagious respiratory infection. It causes a total-body skin rash and flu-like symptoms
- Mercury program**– NASA's first human spaceflight program
- Mercury 13**– thirteen American women who were part of a privately funded experiment to put them through the same test as NASA astronauts in the early days of the space program to determine the differences between men and women
- meteorologist**– branch of science concerned with the processes and phenomena of the atmosphere, especially as a means of forecasting weather

microgravity– a condition of very low gravity where weightlessness results, as in an orbiting spacecraft

micrometeoroid– a tiny meteoroid; a small particle of rock in space, usually weighing less than a gram. Due to their high speed, they can be dangerous to Space hardware and astronauts.

micrometeoroid shield– impact shield used to protect spacecraft from collisions with microscopic particles in space and orbital debris. Most micrometeoroids measure no more than a millimeter (0.04 inches) across and weigh less than a gram.

MILAMOS Project– launched in May 2016, the Manual on International Law Applicable to Military Uses of Outer Space (MILAMOS) Project aims to develop a widely accepted manual clarifying the limitations international law places on the threat or use of force in outer space

misinformation– false information designed to deceive

motor whale boat– small open hulled double-ended boats used by the Navy and Coast Guard as safety and crew transport vessels in modern times while originating in the hunting of whales during the 1600s and through the early 1920s

need-based financial aid– a combination of federal, state, and institutional grants/scholarships, loans, and other financial assistance offered to a student based on their ability to pay for their education and their demonstrated need for support

net price calculator– a federally mandated tool that each school has on their financial aid website, allowing families to see an estimated financial aid package for which they might be eligible

no-fault law– requires every driver to file a claim with their own insurance company after an accident, regardless of who was at fault

non-ionizing radiation– a type of low-energy radiation (ultraviolet, visible, infrared, microwaves, and radio frequencies)

NROTC or OCS– Navy Reserve Officer Training Corps or Officer Candidate School

numbered fleets– major tactical units of the Navy (subordinate to a major fleet command) that are numbered *odd* in the Pacific or West, and *even* in the Atlantic or East

objectively– not influenced by personal feelings or opinions

officer of the deck– when underway, the officer of the deck has been designated by the commanding

officer to be in charge of the ship, including its safe and proper operation. The officer of the deck reports directly to the commanding officer for the safe navigation and general operation of the ship, to the executive officer (and command duty officer, if appointed) for carrying out the ship's routine, and to the navigator on sighting navigational landmarks and making course and speed changes. officer of the deck (OOD) OOD

Oort Cloud– a spherical cloud of mostly icy bodies located in the farthest reaches of the solar system

open enrollment– anyone who registers, and pays any necessary fees, can take classes

operational cycle– in 2014 the Navy moved to an Optimized Fleet Response Plan/Operational Cycle for manning, training, and deploying its ships over a 36 month cycle. According to statements from Navy officials and experts, many elements have failed to materialize.

operational tempo– the demands of operations upon people and equipment. Tempos are too high/low if they are causing forces to lose their capacity to sustain operations and meet crises.

orbiter– is the spaceplane component of the Space Shuttle. About the same size and weight as a DC-9 aircraft, the orbiter contains the pressurized crew compartment, the huge cargo bay, and the three main engines

osteoporosis– a disease which affects the bones, causing them to become porous and brittle

ostracized– excluding (someone) from a society or group

out-of-network– a doctor or facility that has no contract with your health plan, therefore, can charge you full price

out-of-pocket– pay with one's own money rather than with money from another source, such as an insurance company

oversight– the act of watching or overseeing something

Overview Effect– term defined by astronauts at first sight of Earth from orbit. Giving them a sense of the Earth being a small, fragile place invoking a connection with all of humanity.

ozone layer– is a thin part of the Earth's atmosphere that absorbs almost all of the sun's harmful ultraviolet light

payday loan– a short-term, high-cost loan, generally for \$500 or less, that is typically repaid on the borrower's next payday plus fees

- penchant**– strong or habitual liking for something or tendency to do something
- perishable skills**– critical skills that are not practiced on a regular basis decline. This can also include leadership itself
- petty officer**– enlisted ranks from E4-E6 and Chief Petty Officers ranks of E7-E9
- phishing**– an email-based social engineering attack to acquire passwords, bank account numbers, or credit card numbers
- portfolio**– collection of financial investments, such as stocks, bonds, mutual funds, cash, etc
- Pre-commissioning Officer**– someone in the training pipeline or otherwise awaiting to assume command Pre-commissioning Officer (PCO) PCO
- pressurized module**– an enclosure that maintains a selected atmospheric pressure
- private sector**– the non-governmental parts of society and the economy that can be regulated by the government. Examples include corporations, non-profit organizations, and small businesses
- professor emeritus**– an honorary title for a retired professor who wants to stay active in scholarship following retirement
- propaganda**– biased or misleading information used to promote a political cause
- prosecute**– present formal charges against someone in a court of law
- public affairs officer**– master of communication, defending the Navy and other services from misinformation and negative publicity. Working with members of the news media to tell the Navy's story.
- public sector**– the governmental parts of society at the federal, state, tribal, and local levels. Examples include departments and agencies of the executive branch, schools, and police.
- qualify**– it is a big deal to qualify for any and all watchstanding positions across all areas of the Navy. For a Sailor to "qualify" for a portion or all areas of an assigned watch means they know the purpose, responsibilities, and implications of both successful watchstanding and to fail. Failing can result in the injury, loss of life, and perhaps even the loss of the ship or aircraft.
- quarterdeck**– the quarterdeck is the ceremonial center of the ship in port, and is also the entrance point for everyone coming aboard. It is also the station, in port, of the officer of the deck
- quarters**– a daily meeting with face-to-face communication to ensure all Sailors are where they are supposed to be, share information, routine inspections and a time to recognize good performers
- quasar**– a black hole that is emitting an enormous amount of energy in the form of a beam as it heats up material in its accretion disc
- radiation**– energy that comes from a source such as the sun and travels through space at the speed of light. This energy has an electric field and a magnetic field associated with it.
- ransomware**– malware that blocks access to a computer until a ransom is paid
- rate of return**– is the net gain or loss of an investment over a specified time period, expressed as a percentage of the investment's initial cost
- rating**– an enlisted career specialty in the Navy
- reconcile**– to compare two sets of financial records to check that figures are correct and in agreement
- regolith**– lunar dust, rocks, and soil
- regulation**– the rules government uses to impose restrictions or control
- remote sensing**– the scanning of an object from a distance by remote control
- rendezvous**– a set of orbital maneuvers during which two spacecraft arrive at the same orbit and approach to a very close distance
- replenishment operations**– underway replenishment (UNREP) is a broad term applied to all methods of transferring fuel, munitions, supplies, and personnel from one ship to another while the vessels are underway
- resurgence**– a rising again into life, activity, or prominence
- return**– the money made or lost on an investment over some period of time
- risk tolerance**– the amount of risk that an investor is comfortable taking
- risks**– a situation involving exposure to danger, harm, or loss
- robotics**– an interdisciplinary branch of computer science and engineering. Involves design, construction, operation, and use of robots.
- Secretary of State**– a senior cabinet secretary who carries out the president's foreign policies. Appointed by the president and approved by the U.S. Senate. Fourth in line (order of succession) to the presidency.

Secretary of the Navy– the Secretary of the Navy (SECNAV) is responsible for, and has the authority under Title 10 of the United States Code, to conduct all the affairs of the Department of the Navy, including: recruiting, organizing, supplying, equipping, training, mobilizing, and demobilizing. The Secretary also oversees the construction, outfitting, and repair of naval ships, equipment and facilities. SECNAV is responsible for the formulation and implementation of policies and programs that are consistent with the national security policies and objectives established by the President and the Secretary of Defense.

sectors– a sociological, economic, or political subdivision of society and or business

securities– financial investments with some monetary value. They entitle the holder to ownership of a part of a publicly traded company, such as a stock, or a debt obligation, such as a bond.

Service Module– spacecraft that after Lunar Orbit insertion, provided propulsion, life support, and power for the trip to the moon and back. Together with the Command Module, they were referred to as the CSM or Command and Service Modules.

shares– a percentage of ownership in a company or a financial asset

signals intelligence– foreign intelligence collected from communications and information systems

social mores– the customs, norms, and behaviors that are acceptable to a society or social group

solar flare– short eruption of intense radiation from the surface of the sun, often associated with sunspots

Solid Rocket Boosters– solid-propellant rockets used to provide the Space Shuttle enough thrust to escape the Earth's gravitational pull. Solid Rocket Boosters (SRBs) (SRBs)

sovereign government– a recognized government with defined borders that has the power to tax and a monopoly on use of force within its borders

SpaceX– a private American aerospace manufacturer that is a provider of space transportation services and communications based in Hawthorne, California. It was founded in 2002 by Elon Musk.

spear phishing– a targeted phishing effort against a particular individual or small group of people

Structured Query Language (SQL)– a domain-specific language used in programming and designed for managing database management systems

stellar nurseries– an area of dust and gas in space where stars are formed

standard deduction– a fixed dollar amount deduction that varies by filing status. It is determined each year by the IRS.

standing orders– an instruction or prescribed procedure in force permanently or changed or canceled by proper authority; a written discourse that illustrates the commanding officer's views on how he or she wants the ship to operate

stateroom– cabins functioned as sleeping quarters, lounges, and offices. The more senior the officer typically the fewer people sharing the space.

student aid index– a calculation of the financial resources that a student has available to them to pay for college for one year student aid index (SAI) SAI

suborbital flight– is a spaceflight in which the spacecraft reaches outer space but does not complete one orbital revolution

superintendent– equivalent to a college or university president

supernova– the catastrophic explosion of a star in which it suddenly ejects most of its mass

supersonic flight– passage through the air at speed greater than the local velocity of sound

tenets– a principle or belief

test-optional– students can decide whether they submit SAT/ACT scores

touch points– any interaction, including encounters where there is not physical interaction. An opportunity for leaders to share important information in the quest for excellence

transcript– the official school document that lists all the classes you have taken in high school and the grades you earned

treatise– a written work dealing formally and systematically with a subject, including a methodical discussion of the facts and principles involved and conclusions reached

trojan– malware that, once implanted in a computer, provides remote access to an attacker

U.S. Naval Academy– men and women students attending the Naval Academy, its preparatory school and or one of 63 Navy Reserve Officer Training Corps (ROTC) units at colleges and universities across the United States

U.S Pacific Command– this command's area of responsibility includes about half of the earth's surface, stretching from the waters off the west coast of the United States to the western border of India and from the North Pole to Antarctica. It is commanded by a four star flag officer who as one of six unified commanders reports directly to the President through the Secretary of Defense.

virus– malware that can replicate itself and infecting another computer

wardroom– the dining or mess area assigned to officers

Watch Bill– shows the assignments of Sailors for a division, regardless of whether underway or inport

weightless– not being subject to the pull of gravity

windfall– an unexpected profit or gain of money

wiper– malware designed to corrupt or erase a significant portion of memory, usually to make a computer inoperable

worm– malware that behaves as a standalone virus; it doesn't need to infect an application to copy itself. However, it does need to exploit a vulnerability in an operating system.

Index

4th deck, 180
401(k), 117, 139
50-30-20 rule, 75

A

ACT, 41
adjustable-rate mortgage, 98
Admiral Charles Larson, 151
admit, 55
Advanced Placement (AP), 16
advancement exam, 145
Alan bean, 269
Alan Shepard, 267, 277
algorithm, 257
all-sky map, 303
annuity, 126
apartheid, 186
Apollo 11, 284
Apollo 14, 267
Apollo program, 299
apprenticeship, 34
apprised, 162
APR, 93
aptitude, 26
ardent, 162
area of responsibility (AOR), 147, 174
ARPANET, 211
Artemis Accords, 299
Artemis program, 299
articulation agreements, 15
asset, 71
associate's degree, 14
asteroid, 309
astronomer, 310
Astronomical Search for Origins (ASO), 304
ATLAS, 310
authoritarian, 227
auto insurance, 129, 130
Automated Transfer Vehicle (ATV), 287
avionics, 329

B

bachelor's degree, 15
ballistic missile, 275
ballistic trajectory, 314
bankruptcy, 110
Barbara Morgan, 291
battlespace awareness, 250
beneficiary, 125
berthing compartment, 178
black hole, 310
black holes, 311
Blended Retirement System (BRS), 141
Blue Origin, 294
Bob Crippen, 269
bottom line, 154
Buzz Aldrin, 268

C

Cabinet of the United States, 236

calisthenics, 180
candor, 159
Career and Technical Education (CTE), 13
cash value, 125
censorship, 228
certificates of deposit (CDs), 73
certification programs, 13
chain of command, 150
Chairman of the Joint Chiefs of Staff, 153
Chandra X-Ray Observatory, 304
checkbook, 78
checking account, 77
Chief of Naval Operations (CNO), 171
China National Space Administration (CNSA), 287
citizenship, 20
closing costs, 94
cloud, 209
coalesce, 191
Cold War, 276
college credit, 16
college visit, 32
collision, 171
combatant commanders, 175
combatant commands, 241
combat information center (CIC), 171
command and control, 249
Commandant of the Marine Corps, 175
community college, 14, 39
compound interest, 85
Comprehensive Review of the Surface Navy, 172
Compton Gamma Ray Observatory, 303
computer engineering, 258
Computer Fraud and Abuse Act, 232
computer science, 257
Congress, 232
consensus, 163
constructive criticism, 160
co-op, 59
copay, 132
cosigner, 92
cosmonaut, 279
cosmonauts, 270
counterintelligence, 223
countermeasures, 250
court-martial, 178
credit, 102
credit card, 105
credit report, 102
credit score, 102
Crew Dragon, 271
cryptology training, 252
cyanobacteria, 302
cyberattack, 214
cyberbullying, 218
cybercrime, 214
cyber hygiene, 216
cybersecurity, 210
Cybersecurity and Infrastructure Security Agency (CISA), 210, 219, 239

cybersecurity careers, 256
cybersecurity qualifications, 258
cybersecurity training, 258
cyberspace, 209
cyberspace operations, 247, 249, 251
cynicism, 185

D

dark matter, 304
death benefit, 125
debit card, 78
debt, 108
debt-to-income ratio, 109
deductible, 123, 132
deferral, 55
demonstrated financial need, 46
denial, 55, 250
department, 145
Department of Defense (DOD), 241
Department of Homeland Security, 238
Department of Justice (DOJ), 240
dependents, 114
deployment schedule, 145
deposit slip, 78
dereliction of duty, 197
derivation, 20
Dick Gordon, 269
direct deposit, 72
disability insurance, 134
discretionary spending, 75, 236
distributed denial of service, 215
diversification, 85
dividends, 83
division, 145
doctorate degree, 327
dollar cost averaging, 85
Doris Lessing, 148
dual enrollment, 16
dusty disks, 303

E

earned income, 140
earnest money, 97
economic espionage, 223, 229
Eileen Collins, 291
election interference, 222
Electromagnetic Pulse (EMP), 308
electromagnetic spectrum, 247
Elon Musk, 295
emergency fund, 74
encryption, 229
end state, 146
enlistment, 19
equity, 94
escrow, 97
espionage, 220
ethical leadership, 185
ethics, 184
European Space Agency, 287
exchange-traded funds (ETFs), 84
extended warranty, 93
Extravehicular Activity (EVA), 268

F

face value, 84
Fair Debt Collection Practices Act (FDCPA), 110
fair-market value, 138
Federal Bureau of Investigation (FBI), 240
Federal Communications Commission (FCC), 209
federal direct loan, 47
Federal Work Study Program (FWSP), 47
fee waiver, 41
financial aid, 46
fires, 249
fixed-rate loans, 98
flag officer, 174
flexible spending account (FSA), 133
"foot stomp", 159
formulaic admission, 40
Fortune 50, 187
Free Application for Federal Student Aid (FAFSA), 46

G

Galilean moons, 287
gamma-ray bursts, 310
gamma rays, 303
Gateway Lunar Outpost, 300
Gemini, 268, 279
General Colin Powell, 153
General Education Development (GED), 39
geo-political situation, 172
geosynchronous, 253
geosynchronous orbit, 308
grace period, 106
grant, 47
Great Observatories, 291
gross pay, 71, 115
guaranteed transfer, 55
Guion Bluford, 291
gyroscope, 275

H

habitable zone, 302
Habitation and Logistics Outpost (HALO), 300
harassment, 200
hard skills, 63
hazing, 218
health insurance, 131
health reimbursement arrangement (HRA), 133
health savings account (HSA), 133
helmsman, 169
HMO, 132
holistic admission, 40
homeowners insurance, 127
Hubble Space Telescope, 303
Hugh Thompson, 198
hypersonic weapons, 314

I

impetus, 203
indictment, 240
Individual Retirement Account (IRA), 140
Informational interview, 34
information security, 247
information systems training, 252
information warfare community, 261
inspection, 178

insurance, 123
intelligence community, 239
interest, 85, 97
interest rate, 89
Internal Revenue Service (IRS), 114
International Baccalaureate (IB), 16
International Space Station (ISS), 292
Internet Crime Complaint Center, 241
internship, 34
interview, 34
invest, 82
investing, 71
IRS Form 1040, 118
IRS Form W-2, 116
IRS Form W-4, 114
itemized deduction, 118
itemize deductions, 114

J

James B. Stockdale, 190
Jeff Bezos, 294
Jerrie Cobb, 280
job shadowing, 34
John Glenn, 277
John Young, 269
joint, 241
junior officer, 174
junk, 196

K

Karel Montor, 192
Kathryn Sullivan, 291
Kayla Barron, 271
Kepler-452b, 303
Kessler Syndrome, 308
kudos, 160

L

LabVIEW, 328
leadership, 145
lease, 90
leave, 161, 204
letter of recommendation, 43
liability, 128
life insurance, 125
light years, 304
liquidity, 73
litmus test, 192
loans, 89
lunar outpost, 300
Lunar Rover Vehicle (LRV), 285

M

Mae Jemison, 291
malware, 214
manipulation, 250
Marine Corps Cyber Forces Command, 247
Mariner 4, 300
Marquet, 167
Mars, 300, 301
master's degree, 327
material readiness, 171
Matlab, 328
maturity, 84

Maxime Faget, 277
Merchant Marine, 19
Mercury 13, 280, 294
Mercury Program, 277
merit aid, 48
meteorologists, 327
microgravity research, 293
micrometeoroid, 299
MILAMOS Project, 330
military college, 18
Military Lending Act (MLA), 110
Mir space station, 286
misinformation, 229
money market account, 73
moonquake, 299
mortgage, 97
multifactor authentication, 216
mutual funds, 84
Mý Lai massacre, 198

N

NASA's Great Observatories, 303
National Aeronautics and Space Administration (NASA), 267
National Cyber Director, 237
national security, 210, 236
National Security Agency (NSA), 244
naturalization, 20
need-based financial aid, 46
Neil Armstrong, 268
net pay, 115
net price, 45
Net Price Calculator, 45
New Space, 295
NORAD, 315
NROTC or OCS, 152

O

objectively, 162
occasional expense, 76
officer of the deck (OOD), 169
Old Space, 295
Oort Cloud, 311
open admission, 55
open enrollment, 55
operational cycle, 174
Operation Fishbowl, 308
orbital debris, 308
orbiter, 269
osteoporosis, 294
ostracized, 199
out-of-network, 132
out-of-pocket, 123
oversight, 232
overview effect, 296
ozone layer, 310

P

payday loan, 89
Pell Grant, 47
penchant, 160
periodic expense, 76
permanent life insurance, 125
Pete Conrad, 269

petty officer, 174
phishing, 210, 215
PIN, 78
plebes, 180, 202
PLUS loan, 47
policy, 123
policy limit, 123
portfolio, 85
PPO, 132
pre-commissioning officer (PCO), 169
premium, 123
pressurized modules, 293
principal, 89
principle, 97
private college, 15
private mortgage insurance, 97
private sector, 262
professor emeritus, 186
Project Apollo, 284
propaganda, 229
property insurance, 127
prosecute, 240
public affairs officer, 180
public college, 15
public-private partnership, 231
public sector, 259

Q

quarterdeck, 203
quasars, 303

R

radiation, 307
ransomware>, 211, 215, 218
rate of return, 82
Readiness Reform Oversight Council (RROC), 175
reconcile, 79
regolith, 285, 299
renters insurance, 127
replenishment operations, 174
required minimum distributions, 140
Reserve Officers' Training Corps (ROTC), 19
return, 71
return on investment (ROI), 59
Rhea Hurtle, 280
Richard Branson, 296
risk, 71, 82
risk tolerance, 83
Robert Goddard, 275
robotics, 327
Ron Ridenhour, 198
Roth IRA, 140

S

Sally Ride, 281, 291
SAT, 41
Saturn V, 284
saving, 71
savings account, 73
savings bonds, 84
savings deposit program (SDP), 73
scholarships, 48
Scott Kelly, 270
Secretary of State, 153

Secretary of the Navy, 175
service academy, 18
simple interest, 85
Sir Richard Branson, 294
Skylab, 285
S.M.A.R.T., 27
social mores, 204
soft skills, 63
solar flare, 309
Solid Rocket Boosters (SRBs), 269
sovereign governments, 229
Space Force, 316
Spacehab, 292
space shuttle, 270
Space Shuttle Challenger disaster, 292
Space Shuttle Columbia disaster, 292
Space Surveillance Network (SNN), 317
space tourism, 296
space tourist, 294
SpaceX, 295, 300
spear phishing>, 211, 222
Spitzer Space Telescope, 304
Sputnik, 276
SQL, 328
standard deduction, 118
Starfish Prime, 308
state cybersecurity laws, 233
stellar nurseries, 303
S.T.E.M., 64
stock, 83
Strategic Readiness Review, 175
Student Aid Index (SAI), 46
student loans, 50
suborbital flight, 267
subsidized direct loan, 47
superintendent, 152
supernova, 310
supersonic flight, 275

T

tax credits, 118
tax deduction, 118
tenet, 158
Tenth Fleet, 247
term, 89
term life insurance, 125
terraforming, 302
terrestrial planet, 302
test-optional policies, 41
The Rule of 72, 86
The United Nations (UN), 229
thrift savings plan (TSP), 140
Tiangong Space Station, 287
total cost of attendance (COA), 45
touch points, 175
trade school, 13, 39
transcript, 40
treasury bills, 84
trojan, 215
troll, 222

U

umbrella policy, 129

United States Space Command (SPACECOM), 317
unsubsidized direct loan, 47
U.S. Cyber Command, 242
U.S. Fleet Cyber Command, 247
U.S. Naval Academy, 151
U.S. Pacific Command, 151
USS Antietam, 171
USS Fitzgerald, 171
USS Hornet, 272
USS John S. McCain, 171
USS Lake Champlain, 171
USS Santa Fe, 167

V

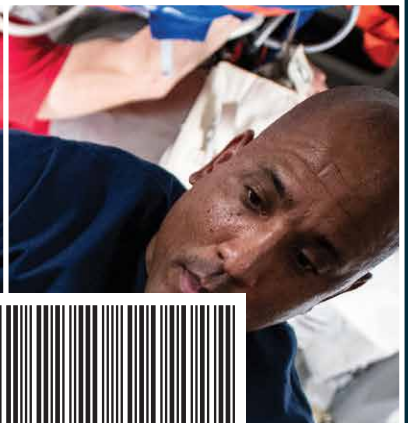
Van Allen Radiation Belts, 307
Victor Glover, 271
Vietnamese boat people, 196
Vietnam War, 198
Virgin Galactic, 294
virus, 215
volunteering, 19

W

waitlist, 55
Wally Funk, 280, 294
wardroom, 176
Watch Bill, 187
weightless, 307
Werner von Braun, 275
White House, 236
William Shatner, 294
William Shepherd, 270
wiper, 215
withhold, 114
worm, 215

Z

zero-trust environment, 217



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