SPACE PIRACY

PREPARING FOR A CRIMINAL CRISIS IN ORBIT

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FOREWORD BY COL. ERIC FELT

WILEY

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For Leslie and Rachel

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Foreword

I've spent the better part of three decades serving in the United States Air Force, and now the Space Force, working to deter conflict and ensure that the United States leads the world in space. The capabilities I have contributed to developing include space communication, space control, missile warning, intelligence/surveillance/reconnaissance, position/navigation/timing, weather, and access/mobility/logistics—the whole gamut. Success in these critical missions requires that we perform constant assessments of space-related threats.

For two decades following the Cold War, our threat analyses focused almost exclusively on perils naturally occurring in the space environment. Following the destructive Chinese antisatellite missile test in 2007, we pivoted to primarily focus on the threats from China and Russia, potential adversaries powerful enough to field their own space programs and weapons. Today the list of potential nation-state threats has grown, but we are still focused on deterring only sovereign states. This is about to change, in my view, and this book offers a glimpse of what is coming: irregular threats to space, especially crime and piracy.

The authors argue persuasively that space piracy is inevitable. As the costs and technical barriers to accessing space continue to come down, new wealth will be generated in space. At least some of that wealth will be able to be stolen or held hostage. Many state and nonstate actors will be capable of space piracy; some will inevitably act upon the opportunities they see.

As for the timing of this threat, we don't know when space piracy will become a real issue, but it will arrive at some point, perhaps sooner than we imagine. Some forms of space piracy are possible today, such as radiofrequency jamming and cyber hostage-taking. More stereotypical piracy, such as stealing precious metals mined from asteroids, may or may not be decades away.

Regardless, with such an uncertain timeline, now is the time to consider the threat and develop our strategies, tasks that require few resources. If developed and executed well, our strategy could very positively shape our future in space.

What should we do about the threat of space crime and piracy? In my view, we can deter and defeat space pirates, but not by doing nothing. The book thoughtfully outlines specific actions that can and should be taken today, specific actions for the intelligence community, Space Force, private sector, and other stakeholders. We need to build upon the existing international frameworks and institutions, such as the Outer Space Treaty and United Nations, and learn from the history of tackling piracy in other domains.

This is a thought-provoking book written for everyone who builds or relies upon space capabilities—and that is almost everyone. Every Space Force Guardian needs to read it so that we can contemplate and debate these critical topics. Just as the Navy counters piracy on the high seas, the Space Force is the United States' first and best choice for mitigating the threat of space piracy. To this end, the topic of space piracy needs more intellectual attention, discussion, and strategizing. Space Piracy is a tremendous first step in that direction.

—Col. Eric Felt, US Space Force
Director, Space Systems Engineering
Office of the Assistant Secretary of the Air Force
for Space Acquisition and Integration

Preface

When Neil Armstrong exited the lunar module on July 20, 1969, and became the first human being to set foot on the moon, he famously said, "That's one small step for man, one giant leap for mankind." It was one of the most awesome and inspiring moments in history. Through remarkable feats of science and engineering, a man had ventured forth into outer space "for mankind," coming in peace as a representative of the noble aspirations and capabilities of the entire human race.

Armstrong's sentiment also appeared in the groundbreaking Outer Space Treaty in 1967. It alludes to "the common interest of all mankind in the progress of the exploration and use of outer space for peaceful purposes."

Today, after half a century of engineering breakthroughs, outer space is rapidly transforming into a commercial resource that is available for the use of all humankind. And, for better or worse, the broadening exploitation of space is exposing the ignoble side of humanity, with the potential for crime, corruption, piracy, and war in space. Indeed, this is already happening, though at a small scale. It's early in space's transition from noble representation of the best of humanity to a spectacle of its ignobility, but the moment has arrived, and we ignore it at our peril.

In this regard, science fiction has been well ahead of practical realities, depicting space as a place where anything goes, and anything will. George Lucas saw it coming in 1977, with the notorious bar scene in *Star Wars* giving us a preview of the dark underbelly of outer space, though *Star Trek* was already trafficking in space criminality a decade before. Reality is starting to catch up with science fiction, though, more quickly than many of us might imagine. As space becomes the site of wealth creation, a process that is already underway, it will almost certainly become the site of criminal activities, including acts of piracy.

Are we ready for piracy and crime in space? This is the theme we intend to explore in this book. For some, the idea of bad behavior in space is anathema, an affront to their sense that space should be a zone of human cooperation and heroic endeavor. For others, it has long been clear that space has the potential to become a lawless cesspool featuring the worst that humanity has to offer.

The time has come to reconcile these conflicting views. We will try, suggesting that the best of humanity's institutions, from the law to intelligence services, corporations, the sciences, and the military, can come together to combat what the worst of us may be dreaming up.

Introduction

In 1929, a 17-year-old German boy named Wernher Magnus Maximilian Freiherr von Braun bought a movie ticket that would change his life and, eventually, the world (see Figure I.1). In a Berlin cinema, he watched what is considered the first great science fiction epic: Fritz Lang's two-and-a-half-hour silent film *Frau im Mond* (Woman in the Moon).

FIGURE I.1 Dr. Wernher von Braun at the Marshall Space Flight Center in Huntsville, Alabama, 1960.
Source: NASA

The movie tells the story of a visionary scientist, Professor Mannfeldt, who has a plan to send a rocket to the moon, where he believes there is a fortune in gold. A gang of thieves steals the professor's plans and threatens to destroy his mission if he doesn't cut the gang in on it. He agrees and sends his assistant, a woman named Friede, to the lunar surface, where she discovers breathable air and lots of gold. But the whole situation goes sideways, and the thieves try to hijack the rocket, destroying it in the process.

The depictions of the rocket inspired von Braun to devote his life to rocket science. In fact, they were so realistic that the Gestapo banned the film after von Braun commenced his top-secret work on the notorious V2 rocket, which devastated London in World War II. After the war, von Braun enabled the Americans to put a man on the moon with the Apollo missions—just 40 years after he watched Lang's film (see Figure I.2).

Even as space exploration was in its infancy, forward-looking people recognized that space could be a venue for piracy, a form of criminal mischief and war by other means that has existed for millennia. A 1952 *Colliers Magazine* article asked, "Who Owns the Universe?" and anticipated the threat of pirates operating in space. We're going to start answering that question in this book.

The current security conditions in space are ideal for piracy. Space systems are vulnerable. Great riches await pirates who can breach their poor defenses. The talent pool of available pirates is growing as nations with space expertise become economically and geopolitically unstable. Global criminal cartels allied with rogue state actors are poised to exploit these conditions for profit.

It is our contention that as the world embarks on lucrative ventures in space, it is a virtual certainty that space piracy will soon emerge as a major threat to their success. This may seem hard to believe, but the world has changed since the heady days of the Apollo program. The conditions that favor space piracy are on the rise.

While space exploration has long been the province of national governments, an honorable form of national service and international cooperation, space is rapidly transforming into a corporate free-for-all and playground for rogue states. Stakeholders will ignore these dramatic shifts in policy and ethics at their own peril.

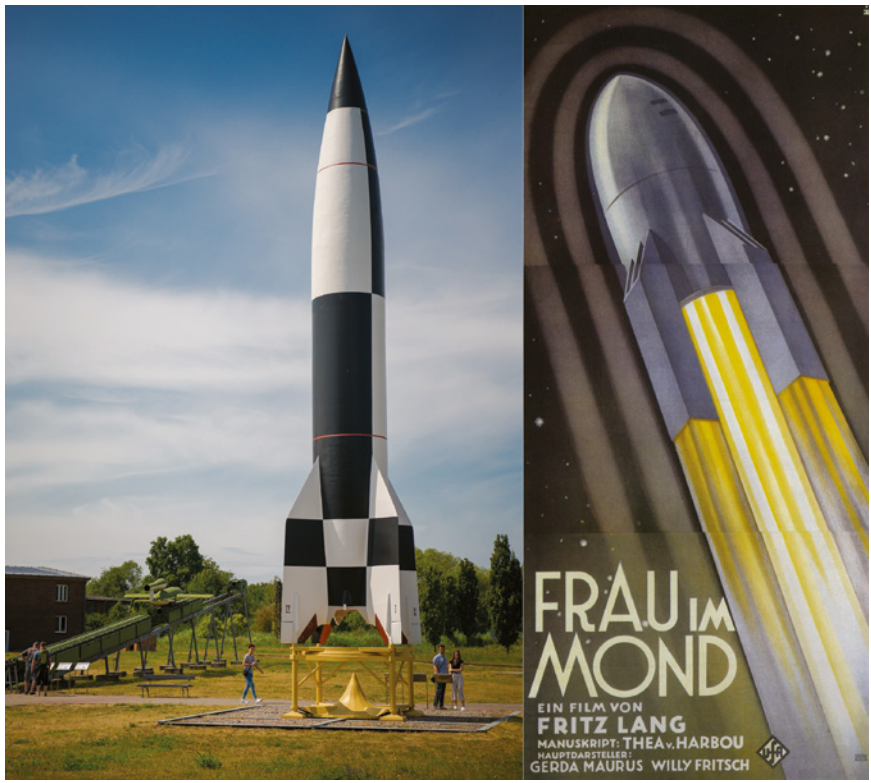

FIGURE I.2 Still frame from Fritz Lang's 1929 silent film *Frau im Mond* (Woman in the Moon), juxtaposed with a photo of the German V2 rocket, shown at the Rocket Center of the Third Reich in Peenemuende, Germany and the poster for Fritz Lang's 1929 silent film "Frau im Mond" (Woman on the Moon)"
Sources: Nataliia Budianska/Shutterstock and Pictorial Press Ltd/ Alamy Images

Today, nearly a century after *Frau im Mond,* space is home to a large, growing collection of industries. Corporations are following in the footsteps of Professor Mannfeldt. They are contemplating mining for gold on asteroids like modern-day incarnations of the professor. And, as the plot of the film suggested even in 1929, space was a rich venue for criminal conspiracies. *Frau im Mond* was disturbingly prescient.

It is our view that piracy in space will become a lethal, vexing, and technologically sophisticated aspect of the new space economy. It will force all

the stakeholders in space to rethink how they operate in space. It will also lead to a reckoning as to the efficacy of legal, military, and global enforcement bodies in dealing with crime, piracy, and smuggling in space.

With all of this in mind, let's begin.

Can You Actually Predict the Future?

Before we dig into the topic of space piracy, we feel a need to address a question that has come up multiple times in the process of writing this book. That is, "Who are you to imagine that you can predict the future?" It's been asked more politely than that, but the gist is the same. This book anticipates events that have not yet occurred, though there have been some incidents that show clear signs of what's coming. Who are we to prognosticate?

This is indeed a problem. Serious people don't consult crystal balls and expect to be taken seriously. Only a charlatan would predict the future, right? The answer is yes and no. Yes, making guesses about what is going to happen next year, or in 20 years, requires an admission, up front, that you could be wrong, and probably are. And yes, only a charlatan would make a claim like, "Tomorrow, the Dow Jones will go up 102 points."

At the same time, many of us, including a lot of highly paid and very serious people will say things like, "If the Federal Reserve raises interest rates next week, there is a high probability that the Dow Jones will go down." That is a prediction of a future event that is based on past experience. It is not absolute. Rather, it is framed in terms of probability. In this sense, you can predict the future.

We feel comfortable predicting that piracy and other forms of mass criminality will arise in space as the sector grows more commercialized. Like the stock analyst who expects the Dow to drop if interest rates go up, we too anticipate that criminals will target rich space assets based on past experience. In our view, just as pirates over millennia have tried to seize ships carrying valuable cargoes when they transited narrow sea passages, so too will space pirates attempt to hijack space riches when they have the opportunity. This is not a fanciful guess. It's a prediction with a high probability of coming true.

Furthermore, if we take a step back from this immediate topic, we can see that predicting the future is the foundation of much policy planning.

The Pentagon, for instance, strategizes, recruits, and spends based on future warfighting scenarios. Does the Pentagon know for sure that Country A is going to attack Country B, drawing the United States into the conflict? Of course not, but they have to plan for that scenario. We have military units formed and ready to address conflicts that have only a probability of occurring.

Whom This Book Is For

Who should read this book? In our writing process, we have spoken with many truly impressive people who have much more specific knowledge in their areas of specialty than we do. Our intention is not to replicate their entire expertise here. Indeed, each of these people could write their own books, and several have. Instead, our approach is to be integrative. The book blends our own knowledge with that of our subject-matter experts.

This book is for anyone who wants to gain a broader understanding of the potential for space piracy and crime than they already possess. If you're from the finance field, for example, you will gain insights into the geopolitical aspects of space piracy from this book. If you're from the world of intelligence, you may learn a thing or two about space insurance, and so forth. Our goal is to broaden your horizons with a (we hope) insightful overview of the subject.

Not Authoritative, by Design

This book is not authoritative in nature. That's on purpose. For one thing, it's hard to be authoritative on a topic so speculative. More importantly, dealing with space piracy is by necessity a process that has to involve experts from a range of disciplines. There are no individuals who can be authoritative about space piracy. The subject is too multithreaded, too integrative for that, at least in the present. As time goes on, we may see space piracy experts, people who can speak with authority on the topic. Today, however, our goal is to introduce the full breath of subjects that come under the rubric of fighting space piracy and initiate the interdisciplinary dialogues that will ideally make progress on this serious issue.

Space Piracy, an Overview

What do we mean by *space piracy*? A simple answer is robbery or hijacking of objects of value in space, akin to piracy on the high seas. Just as pirates board oil tankers off the coast of Africa and hold them for ransom, we envision space-based pirates hijacking space cargoes and demanding payment to set them free.

The specifics of how space piracy would work remain to be seen, but in all probability, space piracy will be significantly more complex than piracy at sea. For one thing, space piracy requires the use of costly, sophisticated space equipment. The barriers to entry are higher in space than they are on the world's oceans.

Space piracy will also probably involve the use of robots or other automated technologies to perform many of the acts of piracy. Human space travel is rare and very expensive. Though it may be entertaining to imagine a Johnny Depp character swashbuckling on the lunar surface, the greater likelihood is that someone on Earth will direct a robot to hijack the item of value and hold it for ransom.

Additionally, space piracy may encompass criminal acts that take place on Earth. This might mean hijacking launch stations and satellite uplink stations. In fact, in our view, space piracy could take place across at least four different kinds of space, including outer space, cyberspace, terrestrial space, and virtual/AI-generated space.

A useful definition of space piracy might also include a broader range of criminal activities, analogous to those that take place at sea today. For example, smuggling, which is not piracy per se, falls into a comparable zone of law enforcement (or lack thereof). Similarly, trafficking in sanctioned goods, a la today's Russian "Dark Fleet" oil tankers, could have a corollary in space. Such acts trigger the same questions of space sovereignty, space law, and space policy as space piracy. For this reason, it makes sense to include them in our analysis.

Is This Book Necessary?

The other question we've been asked a few times is "Why are you writing this? The problem doesn't exist yet." That's a fair question. The world is

experiencing plenty of real problems in the current moment. Why worry about something that hasn't happened?

We should be worrying about space piracy right now. For a reference point, take a hard look at the state of maritime piracy. You will see a criminal problem that lacks effective solutions. There are myriad reasons for this, but the most serious issues have to do with a lack of a coherent body of law or policy to rein in piracy on the high seas. Many of the same problems exist in space.

Without action, space pirates will have an open field for the most outlandish and costly criminal activities—if we don't prepare to combat them. The ongoing disruptions by nonstate actors like Yemen's Houthis, who are wreaking havoc on world shipping, further underscore the problems that come from being unprepared to deal with irregular and asymmetric adversaries.

The other question that comes up is "Why now?" Space commerce is in its infancy. The kind of high-value space assets and industries we contemplate in this book are decades, if not centuries, in the future. Why deal with this issue now? Isn't there plenty of time to prepare?

Yes and no. We needn't rush. Figuring this out could take a few years, but now is actually the ideal time to start preparing for this coming criminal crisis in space. We have several reasons for taking this stance. For one thing, bad policies tend to harden and become difficult to change. We see this with maritime piracy, where centuries of maritime law have created a virtual straitjacket for shippers and law enforcement agencies that want to fight piracy. If we want to avoid such an outcome in space, we need to start figuring out better policies today.

Cybersecurity offers another cautionary tale. The world is in the midst of a massive cybercrime wave that costs at least $200 billion a year to deal with, and the results are pretty abysmal. Computer systems remain insecure, despite the fortunes being spent to protect them. The current cyber disaster is the direct result of bad decisions made about computer and network security 60 years ago. At the time, few people envisioned a global network connected to billions of personal devices.

It would have been good if they had, because they could have designed more security into the standards and products we use today. But, they didn't, and our data is vulnerable to breach every day. With this lesson in mind, we should look at space technology and policy with a similar eye to

futuristic crime. What can we design more securely today to avoid a criminal catastrophe in 50 years?

Another question that we've encountered is "Does it matter?" The basis for this question is that piracy is a fact of life on the high seas, but life goes on. The world's shipping lanes and supply chains all function, with some allowance for losses due to piracy. Space industry, too, would probably survive piracy, so why bother with it? It's a good question, but in our view, a better question to ask would be "If we can avoid a major problem, why hesitate?" Why ignore a threat that will surely have an impact on space commerce, a threat that could mask hostile action by geopolitical adversaries? The technology used by space pirates will probably be more lethal than that used by today's sea pirates. The problem is at least worth a serious look in the present day.

If the time horizon bothers you, consider the Treaty of Versailles, which ended World War I. It's been 104 years since the treaty went into effect, and the world is still convulsing from its impact. The endless wars in the Middle East are but one example of how a 104-year-old document set massive, intractable conflicts into motion.

The decisions we make about space policy today will have ramifications for hundreds of years. It's on us to gather our wisdom and develop policies, legal frameworks, and military/intelligence organizations that can keep space safe from crime and piracy. It's a big responsibility, but we think we're up for it.

What's Inside

Our goal in this book is to introduce the idea of space piracy, describe how we think the phenomenon will occur, and then offer some suggestions for mitigating the risk. We refer to our content as "speculative nonfiction." We start by sharing some potential space piracy scenarios in Chapter 1, which we have written in a second-person "this is happening to you" voice to make the risks and impacts of space piracy vivid to you, the reader. We cover possible space piracy scenarios that could take place today, as well as in the future. Chapter 1 concludes with some thinking about the likelihood of these scenarios becoming realities.

In Chapter 2, we digress into a brief history of piracy, starting with piracy in the ancient Mediterranean Sea and continuing up through the "golden age" of piracy in the seventeenth and eighteenth centuries. We define and discuss the respective stories of privateers, who were given "letters of marque" by their monarchs to plunder enemy vessels, and buccaneers, who simply stole to get rich.

We go into some detail on the history of piracy because we believe the past is prologue. The same kinds of forces and power vacuums that led to widespread piracy in the past are looming in the future of space. The old piracy provides a great platform to look at piracy as a tool of geopolitics, and several other important lessons about how the world actually works, versus how we want or think it works.

We continue from there in Chapter 3 to an analysis of the emerging multitrillion-dollar space economy. This is a necessary part of the story, because if there isn't going to be any wealth in space, there will be nothing to plunder. We look at the near-term market for satellite industries and related fields like in-orbit servicing. We explore the potential for lunar industries, including lunar mining and the use of the moon as a platform for launching large-scale space missions of all types.

After laying out the tradition of piracy and discussing how it is endemic to the human condition, Chapter 4 gets down to defining space piracy in more detail. We offer potential structures of space pirate organizations and how they might operate. This includes a look at some of the leading criminal organizations, such as the major crime cartels. These groups have the money and organizational cohesion to pull off crimes in orbit. This chapter also differentiates space privacy from space warfare. It considers the potential for privateering in space.

Chapter 5 devotes itself to space hacking. We felt this subject deserved a significant degree of attention for several reasons. For one thing, space hacking is occurring today, and it is arguably the first budding of what will become a much larger space pirate enterprise as the future unfolds. Additionally, given that space vehicles are platforms for computer technology, their vulnerabilities are worth exploring as a way to get a better sense of how space commerce can be disrupted by piracy.

Chapter 6 takes on space law, policies, and treaties. This is a mammoth topic that is central to the entire discussion of space piracy and crime.

Entire books have been written on this, so we're just scratching the surface. Nevertheless, we endeavor to give you as full an understanding as possible of the existing legal frameworks in space, as well as their limitations. Space is a "commons," similar to the world's oceans. For this reason, as we explain, maritime law provides a roadmap for what law in space may look like as it evolves.

It's not a simple or soothing subject. There are a lot of dangerous blank spots in the space law landscape. Sovereignty is muddled. Enforcement is effectively impossible, even when the law is clear, and that's not very often. The maritime practice of "flags of convenience" will likely surface in space, further complicating efforts to define and enforce laws within space's meager legal framework.

Having discussed the underlying issues defining space piracy and law, the book then turns to its more specific potential impacts. Chapter 7 goes into greater detail answering a question posed in Chapter 4, which is "Who will be the space pirates?" We don't know, of course, but we will make some educated guesses. In our estimation, the best candidates for space piracy are the existing criminal cartels. They have the resources and strategic resolve to enter this expensive but lucrative field of crime.

Chapter 8 deals with the potential for space piracy and crime to affect national security. We will focus on the United States, but space is a factor in national security for every nation. We will also challenge some prevailing assumptions, such as that China looms as the aggressor in this context. This is not necessarily true, and it's valuable, in our opinion, to question the existing thinking.

We will explore the interplay between three interlocking realms that affect national security in space. They are sovereignty, criminal organizations, and private enterprises. The latter category may include corporations that either have or arrogate the ability to act as quasi-sovereigns in space like the British East India Company did in the eighteenth and nineteenth centuries.

Chapter 9 looks at space piracy and crime from the perspectives of business and finance. We will examine the potential for money laundering in space. We will also discuss the potential for legitimate businesses to become inadvertent vehicles for space piracy, such as through the work of corrupt insiders—but also the possibility that criminals will take over legitimate businesses and use them for space piracy purposes.

In Chapter 10, we answer the big question that should be on your mind as you read this book: "What can be done to prevent space piracy and crime from becoming a huge problem?" It is going to be impossible to stop all space crime, but we now have a chance to think through ways to mitigate the worst of it. Chapter 10 offers policy recommendations and countermeasures to reduce the impact of space piracy and crime. These include some legal recommendations, ideas for new space treaties, and suggestions for secure engineering of space technology.

Chapter 10 then takes policy ideas into the realm of practicality. Who will enforce these policies? As at least one former member of the intelligence community mused, "That is a really good question…." We believe that combatting space piracy and crime will only partly be a matter for law enforcement. The transnational and questionable sovereignty issues in space will disempower traditional law enforcement in space.

Rather, we think that intelligence services, along with the armed forces, will be front and center in dealing with space piracy. What this will actually look like remains to be seen, but the good and bad experiences in confronting maritime piracy offer some clues as to how this might be best be handled. We will also contemplate some novel organizational constructs for intelligence and alliances between previously disconnected entities that will serve the mission of fighting space piracy and crime.

Possible steps include empowering the U.S. Space Force to fight space pirates. Shoring up space cyber defenses and updating international treaties will ensure the United States has unfettered freedom to combat space piracy in space and on land. Going further, we discuss the development of novel public/private cooperation between intelligence agencies, private firms, law enforcement agencies, and others.

About Us

As coauthors, we come to this subject from different backgrounds. Marc Feldman has been active in the business of space since the 1980s, when he was instrumental in setting up Televisa's first satellite operations. Since that time, he has advised and invested in a variety of space ventures. He has also worked in the intelligence field. Hugh Taylor is a professional writer and