



SPACE SECURITY  

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*OR*

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SPACE WEAPONS?

A GUIDE TO THE ISSUES  
SPACE SECURITY PROJECT

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The United States has a very important choice to make between space security and space weapons. Space security means that the satellites we depend on every day to save lives, grow our economy, and support national security will remain available when needed. No nation benefits more from space or has more to lose if space becomes a shooting gallery than the United States.

Space is now mercifully free of weapons. The last Cold War test of a satellite-killing weapon occurred twenty years ago. This moratorium is now being challenged. The US Air Force has published and seeks to implement a new doctrine calling for space weapons. If the US tests and deploys these weapons, other nations will surely follow suit, and then everyone's satellites will be endangered. Satellites are expensive and extremely hard to defend. Space weapons don't cost very much and are easy to build. Debris in space kills indiscriminately. Space warfare would risk the loss of live-saving satellites. We can also expect far greater casualties in war. US leadership, global commerce, and US alliances will suffer. Space weapons undercut national and international security.

This guide is offered to encourage a vigorous, informed debate over the fundamental choice we now face in space. In the pages that follow you will see three different icons to illuminate this debate:



**Questions and Answers** about space security



**A Closer Look** at the issues involved



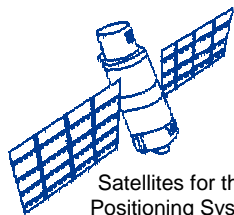
**Facts on File** about space security

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I hope that readers will find this guide to the issues useful, in clarifying the consequential choice before us and in offering a far wiser alternative to space weapons.

Michael Krepon  
Project Director



Satellites for the Global Positioning System orbit 20,000km above the Earth.



### *What is outer space?*

Outer space is the region beyond the Earth's atmosphere, where satellites in orbit help predict the weather, assist in military and humanitarian operations, help first responders provide emergency assistance, and make our cell phones, pagers, and financial transactions possible. Satellites save many lives every day, and have become indispensable tools for our national and economic security. Outer space is one of the most cooperative arenas of human endeavor. Countries and regional organizations, such as the European Space Agency, share the costs and benefits of operating satellites. At least 19 nations have launch capabilities and at least 40 operate satellites.



### *Why hasn't space become a shooting gallery?*

One reason is that satellites serve as the eyes and ears of nations that have nuclear weapons. An attack on satellites could therefore trigger a nuclear war. Second, satellites are very vulnerable. The nation that starts a space war would have great difficulty protecting its satellites. Third, space warfare would cause debris, and debris lingers and kills indiscriminately in space. Fourth, satellites support global business and commerce. Every nation would be harmed by a space war. Lastly, space is widely viewed as a global commons that should remain a sanctuary blessedly free from the disputes that plague us on planet Earth.



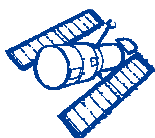
### *Has there ever been warfare in space?*

Space has been thankfully free from warfare. No weapons have ever been used in or from space, and no satellites have been destroyed in combat. The sanctuary of space was maintained during the Cold War, even though the United States and the Soviet Union tested anti-satellite weapons during brief periods. The last anti-satellite test was conducted in 1985.



### *How can we preserve our space sanctuary?*

Space-faring nations can sign up to a Code of Conduct to promote the peaceful uses of outer space and to prevent dangerous military activities in the heavens. The most dangerous activities — and those easiest to verify — are the flight-testing and deployment of space weapons.



The Hubble Space Telescope orbits at an altitude of 600km.



The space shuttle orbits 400km above the Earth's surface.

The atmosphere ends about 100km above the surface of the Earth.

### PENTAGON ENDORSES SPACE WEAPONS

An important shift has occurred during the Bush administration: rather than weaponizing space as a last resort, the US Air Force is now leading the charge towards the testing and deployment of space weapons. Before becoming Secretary of Defense, Donald Rumsfeld chaired a commission that called on the Pentagon to “project power through and from space.” The new US Air Force doctrine, published in August 2004, endorses a strategy to “dominate” space, including the use of weapons. The Air Force calls this “offensive counterspace operations.”

### A NEW PUSH TO “DOMINATE” SPACE

“We are paving the road of 21st Century warfare now. And others will soon follow.”

**Peter B. Teets**  
Undersecretary, US Air Force

“Space superiority provides freedom to attack.”

**Counterspace Operations**  
Air Force Doctrine Document 2-2.1

“Our vision calls for prompt global strike space systems with the capability to directly apply force from or through space against terrestrial targets.”

**Strategic Master Plan**  
Air Force Space Command

“We are not prepared to negotiate on the so-called arms race in outer space. We just don’t see that as a worthwhile enterprise.”

**John R. Bolton**  
Undersecretary of State



### LITTLE SUPPORT FOR SPACE WEAPONS

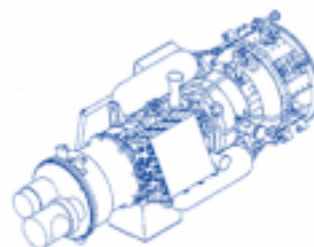
On August 12<sup>th</sup> 2003, 174 nations voted “Yes” on a UN resolution to prevent an arms race in outer space. Only four countries abstained: the Federated States of Micronesia, the Marshall Islands, Israel, and the United States.



### PROGRAMS TO WATCH

Russia, China, the United States, and other countries all have the capabilities to test satellite-killing weapons. The Pentagon plans to establish an anti-satellite weapons test bed at the Redstone Arsenal in Alabama in 2006. A test bed in space is projected in 2012. Other US programs to watch:

**XSS**  
EXPERIMENTAL SATELLITE SERIES



In 1999, an Air Force study called on “the deployment, as rapidly as possible, of XSS-based satellites to intercept...and take action against, a target satellite.”

**NFIRE**  
NEAR FIELD INFRARED EXPERIMENT



The Near Field Infrared Experiment, scheduled for 2006, will engage in close passes of targets in space.

### LOCKING IN US ADVANTAGES IN SPACE

US advantages in outer space have never been greater, while threats to US satellites are far less than during the Cold War. Today, the United States spends \$36 billion a year for activities in outer space — over 70% of all global expenditures. The numbers are even more lopsided for defense spending: Washington spends approximately \$20 billion a year — almost 90% of the global pie — on military-related activities in space.

During the Cold War, the Soviet Union was a significant competitor in outer space, typically launching over seventy space missions every year.

***The United States has never had it so good in space.***

Today, the Russian space program launches less than one-third of this

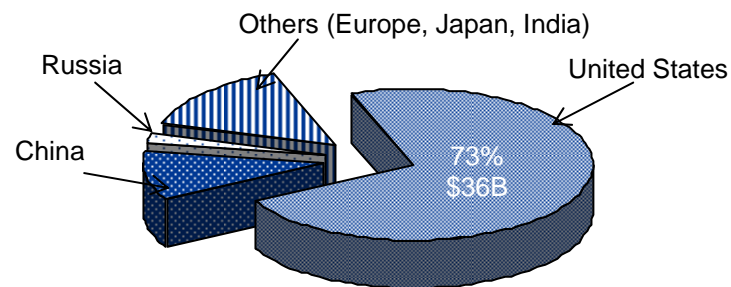
amount. The Pentagon's budget is now over 10 times larger than Russia's military budget.

The Chinese space program is on the move, but it is still decades behind the United States. Beijing has launched eighty satellites in the past thirty-five years, compared to 1,200 for the United States. The Pentagon's budget is over four times larger than Beijing's military spending.

The United States has never had it so good in space — and the US has never had more to lose if space weapons are flight tested and deployed. Washington's most serious potential competitors in space, Beijing and Moscow, say they oppose space weapons and call for measures to prevent them. One way to lock in US advantages in space is to take the lead in promoting a Code of Conduct that bars space weapons, while following President Ronald Reagan's advice of "trust, but verify." The biggest threat to US advantages in space is the false assumption that space weapons will make us safer.



### SPACE BUDGETS OF MAJOR WORLD POWERS



### RUSSIA'S SPACE PROGRAM IS SHRINKING

	USSR 1962-1982	USSR/ RUSSIA 1983-2003	RUSSIA 2004
Total Launches Per Year	73	55	23
Military Launches Per Year	48	31	7
Total Anti-Satellite Tests	20	0	0

### CHINA IS FAR BEHIND THE US

	US	China
First Satellite	1958	1970
First Astronaut	1961	2003
First Anti-Satellite Weapon Test	1959	none
Satellites in Orbit	1,054	46
Launch Sites	8	3



*Why shouldn't we protect our investments in space with fire-power? If we don't, won't our military superiority be impaired?*

Space weapons won't change the outcome of a war: the United States will still win. But, the costs of war will be greater for everyone. The burdens on US ground forces, which are already very severe, become even heavier. US casualties will mount. Since US attacks will be less precise without satellites, others will suffer more, too. Everybody loses if space becomes weaponized.

## WHAT PROTECTION WORKS BEST?

Satellites are vulnerable to debris, radiation, and corrosion. We can improve protection against some hazards, but satellites will remain easy targets for space weapons designed to kill on impact. Satellites are expensive. Unfortunately, space weapons are cheap and easy to build. Satellites usually travel in predictable paths, where they can be found and destroyed. Armor can protect our troops in harm's way, but not satellites targeted for a collision in space.

One way to try to protect satellites is by testing and deploying space weapons to serve as "bodyguards" in space. But then other nations will follow suit. Many people think that the best defense is a strong offense in space — but the rules of warfare are different in the heavens, where an act of destroying someone else's satellite could create the debris that kills your own.

***Destroying someone else's satellite could create the debris that kills your own.***

## KEEP THE MORATORIUM AGAINST TESTING SPACE WEAPONS

Weapons can't protect satellites. Better protection comes from a verifiable ban on testing anti-satellite weapons. The last Cold War test of a space weapon occurred two decades ago. Continuing this moratorium makes more sense than breaking it. We must assume that Russia, China, and other countries are working behind closed doors on anti-satellite weapons — just like the United States. But if none of these weapons are flight-tested and deployed, everyone's satellites will be better off.



*Since the US is militarily dominant on the ground, shouldn't we expect a surprise attack in space?*

It is still far easier and more likely for surprise attacks to be carried out on the ground than in space.

*Since we can't trust others, why don't we launch our space weapons first and demand that others play by our rules?*

By launching space weapons first, we set the rules that others will follow. And to maintain our edge, we will have to shoot down the competition before it joins us.

*What's wrong with preemptive strikes in space?*

Strikes against satellites or shooting down space launches are acts of war — and we may not be able to tell whether we are destroying space weapons or legitimate satellites. Do we really want to be the first nation in history to start a war in space?

*If we don't stop others from launching space weapons through preemptive strikes, won't their space weapons trail our satellites?*

Exactly. During the Cold War, nuclear-tipped missiles were always ready to fire. We will be safer if we can prevent elevating this hair-trigger situation into space.

*But if we exercise restraint, how can we be sure that other countries will play by our rules?*

We don't depend on the good faith of others. We need to hedge our bets. We have the world's best space monitoring capabilities and we enjoy dominant military capabilities. If others insist on testing and deploying space weapons, we will, too. But it is in our economic and national security interest to avoid opening this Pandora's Box.



## SATELLITES SAVE LIVES

Satellites save lives every day by predicting storms and helping those who are lost and in need. No one benefits more from satellites than US soldiers in harm's way. The US armed forces depend on satellites to make their way safely through trackless deserts and dangerous neighborhoods. Satellites help with communication, navigation, and targeting. They help our soldiers win quickly, decisively, and with a minimum of casualties. No nation gains more military benefit from the use of satellites than the United States – and no nation has more to lose if space becomes a shooting gallery.

***No nation has more to lose if space becomes a shooting gallery than the United States.***

## SPACE IS NOW A SANCTUARY

While satellites in space have long been used to assist military operations, space has remained a sanctuary free of weapons. No weapons have ever been deployed or used in space. The 1963 Limited Test Ban Treaty bans nuclear testing above ground, and the 1967 Outer Space Treaty bans all weapons of mass destruction in space. Weapons in space can be particularly deadly. Low levels of radiation from nuclear tests in the atmosphere before 1963 linger to this day. Radiation from the Pentagon's 1962 STARFISH nuclear test damaged or destroyed five US satellites and one British satellite.

***Satellites save lives. When we place satellites at risk, we place lives at risk.***

Ground-based, anti-satellite weapons were tested occasionally during the Cold War, and rudimentary satellite-killing weapons were considered ready for use during brief periods. These weapons were mothballed or destroyed. The sanctuary of space was protected during the Cold War. With wise leadership, it can remain protected today.



*If we don't test new anti-satellite weapons, how can we be sure that others will follow our lead?*

We can be sure that if we begin testing new space weapons, other will follow. But if we maintain our huge lead in military strength, hedge against surprise, and make it clear that we will test and deploy space weapons if others do so, we can better maintain space as a sanctuary.

*Don't we need space weapons to punish states that mess with our satellites?*

We have plenty of ways to punish wrongdoers where they live. We don't need to go into space to punish them. But we also have many ways to punish them in space, using weapons designed for other purposes, such as missiles that intercept opposing missiles.

*If improvised space weapons can be used, aren't prohibitions against newly-designed space weapons useless?*

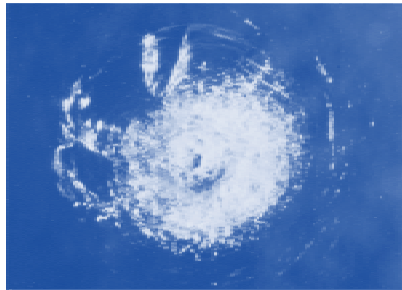
Just the opposite. Existing weapons designed for other purposes have served as an insurance policy against surprise. Because these capabilities already exist, we need "rules of the road" to prevent space warfare.

Space debris is deadly. Almost 3,500 tons of space debris is orbiting the earth. We now track approximately 8,000 pieces of space junk, including defunct satellites and stray nuts and bolts. No one knows for sure how much debris is in space. Larger objects can be monitored, but even paint chips and small fragments can still be deadly because debris travels through space in low earth orbit at ten times the speed of a rifle bullet. Blowing up satellites can create enormous debris fields that will kill indiscriminately anything in their path, including US and allied satellites, the International Space Station, the Space Shuttle, and the Hubble Space Telescope.

***Security in space requires minimizing space debris and stopping space warfare tests.***



### IMPACT OF TINY DEBRIS ON SPACE SHUTTLE



The front window of the space shuttle after being hit by a small paint chip (1983).

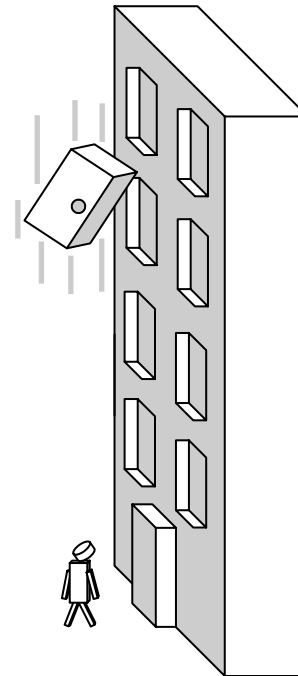
2 mm

Our best efforts to reduce debris will be undermined by the flight-testing and deployment of space weapons. Even if the US chooses non-destructive methods to disable or kill satellites, weaker adversaries may fight by different rules.



### *How dangerous is space debris?*

A marble-sized piece of debris in low earth orbit would impact a satellite with about the same energy as a one ton safe dropped from the top of a five story building.



### *What can we do?*

Every space launch creates some debris, but the US can take the lead in setting tougher standards to minimize this problem. Debris mitigation is an essential part of the Stimson Center's proposed Code of Conduct for responsible space-faring nations.



## SPACE WEAPONS PLACE LIVES AT RISK

Emergency response crews, police cruisers, and search and rescue teams rely on satellite navigation to find their destinations. Our armed forces depend on satellites to win decisively, with a minimum of casualties. Humanitarian relief workers and doctors using pagers and cell phones also depend on satellites. When satellites are endangered, lives are endangered.

**To save lives we need to prevent space weapons.**

## PROTECTING OUR SATELLITES

What can be done to improve the safety of our satellites? We can add passive protective features to new satellites. We need spares and substitutes. We need to be smarter about potential threats to our satellites — natural and man-made. All of these steps will be undermined if space weapons are tested and deployed. To protect satellites and save lives, we need to prevent space weapons.



## SATELLITE RELIANCE: QUICK FACTS

Estimated Number of Emergency Vehicles with Satellite Navigation (2005)	30,000
US Government Agencies that Rely on Satellite Services	100+
Number of Weather Forecast Satellites Used Daily	10
Estimated Number of Lives Saved by Search and Rescue Satellites	17,000+

## EVERYONE RELIES ON SATELLITES

Every day lives are saved through the help of satellites. Here are just a few of the life-saving services that require satellites:

- Police/Fire/Emergency Management Navigation
- 911 Services
- Search and Rescue Operations
- Natural Disaster Damage Assessment
- Disease Tracking
- Hurricane and Tornado Prediction
- Parolee Monitoring
- Remote Diagnosis and Surgery Assistance
- Earthquake and Volcano Monitoring
- Emergency Communication
- Airplane Navigation
- Precise Marine Vessel Navigation
- Train Control and Collision Avoidance



## SATELLITES HELP RELIEF OPERATIONS

During natural disasters, first responders rely on satellite information to save lives. Supply and airlift routes are planned with the help of picture-taking and navigation satellites. Rescuers use the Global Positioning System to help pinpoint victims and relay their location to rescue teams and medical personnel. The life-saving value of satellites was never clearer than after the December 2004 tsunami.

### SPACE AND ECONOMIC SECURITY

Our economy and international commerce rely on satellites. Many things that we take for granted would be lost if space becomes a shooting gallery. Satellites enable us to make financial transactions quickly and securely. They bring us news, sports, and television programming. When we use credit cards to fill up with gas at the pump, we may be using satellites. Cell phones and two-way pagers depend on satellites. Delivery services use satellite communication and tracking services. Cars with satellite radios and navigational guidance depend on a space sanctuary. Space weapons place these services, the revenues they generate, and thousands of jobs at risk.

**Space weapons will put our economy at risk.**



From 1959 to 2003, the United States government invested over one trillion dollars in space.

### SATELLITES ARE EXPENSIVE

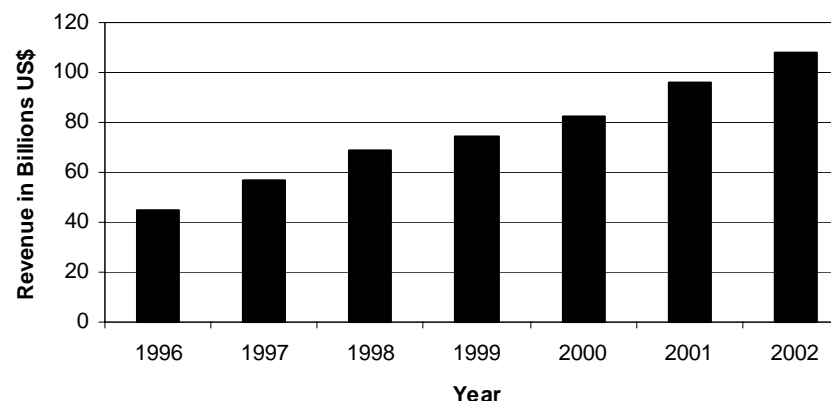
Global Positioning System	~ \$45 Million per Satellite
Weather Satellite	~ \$450 Million
US Spy Satellites	\$1—\$10 Billion
Launch Costs	\$20—\$50 Million per Satellite



### SPACE BY THE NUMBERS

US Space Industry Revenue (2003)	\$41.4 Billion
US Space Industry Employment (2003)	144,000
GPS Units Sold (2003)	10 Million
Satellite Radio Subscribers (2004)	4 Million

### WORLD SPACE INDUSTRY REVENUES



## THE RULES WE LIVE BY

We live by traffic rules and the penal code. People still speed and break laws, but the rules that most people honor are necessary to prosecute rule breakers. Rules also govern financial transactions and help prevent nuclear proliferation. There are also rules of warfare. Rules prevent anarchy and save lives.

Satellites also save lives, by predicting the landfall of devastating storms, helping first responders find the location of accident victims, supporting our troops in danger, and in countless other ways. Some “rules of the road” exist to protect life-saving satellites from harm — but not enough of them.

## AGREED RULES OF THE ROAD FOR OUTER SPACE

### **NO NUCLEAR WEAPONS TESTS IN OUTER SPACE**

*Limited Test Ban Treaty, 1963*  
134 Nations

### **NO WEAPONS OF MASS DESTRUCTION IN ORBIT NO NATIONAL APPROPRIATION OF SPACE BY ANY MEANS**

*Outer Space Treaty, 1967*  
125 Nations

### **COOPERATE ON SEARCH AND RESCUE OPERATIONS IN SPACE**

*Agreement on the Rescue of Astronauts, 1968*  
113 Nations

### **STATES ARE LIABLE FOR DAMAGE CAUSED BY THEIR SPACE OBJECTS**

*Liability Convention, 1972*  
107 Nations

## WHAT ELSE IS NEEDED?

Additional Rules of the Road are needed in space to protect life-saving satellites. The Henry L. Stimson Center suggests a Code of Conduct that would broaden existing protections. Our Code includes provisions to:

- Minimize satellite-killing debris in space
- Avoid and reduce the risk of collisions in space
- Avoid or announce in advance dangerous maneuvers in space
- Create special caution areas around satellites
- Refrain from simulating attacks in space
- Refrain from using lasers to disrupt or blind satellites
- Cooperate on space traffic management
- Refrain from flight-testing or deploying space weapons

## THE CHOICE FOR SPACE

### **WITH RULES OF THE ROAD**

International Cooperation  
Economic Growth  
Public Safety  
Exploration  
More Effective Military Operations  
Fewer Casualties

### **WITHOUT RULES OF THE ROAD**

Space Weapons  
Satellites at Greater Risk  
More Space Debris  
More Military Casualties

### WHAT STANDARDS SHOULD WE SET?

The United States is the world's most powerful standard setter. If Washington takes the lead in testing and deploying space weapons, others will surely follow. Then we will have no assurance that satellites will be available when needed. Space Assurance requires continued respect for the sanctuary of space. But there are no guarantees of good behavior by others if the United States exercises restraint. So US restraint must be accompanied by a hedging strategy to encourage others to follow our lead.

***Space Assurance means that life-saving satellites are available when needed.***

### HOW TO PROMOTE SPACE ASSURANCE

First, by maintaining conventional military superiority to clarify our ability to punish those who mess with our satellites. Second, by improving our intelligence capabilities in space and on the ground, so that we can detect when our satellites are placed at risk. Increased “situational awareness” in space can help deter our adversaries. Third, by not testing and deploying space weapons since they will undermine Space Assurance. Fourth, by carrying out research and development — but not flight-testing — of space weapons. These hedges help clarify to potential adversaries that we can and will respond if they make bad choices. Finally, by strengthening existing standards that promote the peaceful uses of space for all humankind. An important way to do this is by championing a Code of Conduct that sets responsible rules of the road for space-faring nations



### KEY ELEMENTS OF SPACE ASSURANCE

- Maintain Conventional Superiority
- Increase Situational Awareness in Space
- No Flight Tests of Space Weapons
- No Deployment of Space Weapons
- Adopt Prudent Hedges
- Strengthen Norms for Peaceful Uses of Space
- Champion a Code of Conduct for Space-Faring Nations



### *Why not flight-test and deploy new anti-satellite weapons?*

Because if we lead the way, others will surely follow. And if space weapons are ready for use, our satellites will be in constant danger.

### *But can't we out-build and out-spend the competition?*

We can build more and better space weapons than the competition. But their space weapons don't have to be sophisticated or expensive to create havoc in space.

### *Why don't we launch our space weapons first and demand that others play by our rules?*

By launching space weapons first, we will set the rules that others will follow. Shooting down the competition means war. Do we really want to start preventive wars and carry out preemptive strikes in space?

## RULES OF THE ROAD ARE NEEDED IN SPACE

The peaceful uses of outer space can be promoted by a Code of Conduct to clarify “rules of the road” for responsible nations. Codes of conduct exist to prevent dangerous military practices

***Space deserves “rules of the road” to help prevent incidents and dangerous military activities.***

on the ground, in the air, and at sea. For example, during the Cold War, Washington and Moscow negotiated an agreement to prevent

incidents at sea. This agreement requires both navies to avoid collisions and not to interfere with each other’s ships. More than thirty other navies adopted similar agreements.

The United States has been wise to set standards to prevent dangerous military practices on the sea, on the ground, and in the air. Space also deserves “rules of the road” to help prevent incidents and dangerous military activities. The Henry L. Stimson Center has drafted a Model Code of Conduct for responsible space-faring nations. It can be found at [www.stimson.org/space](http://www.stimson.org/space).



## OTHER CODES OF CONDUCT

Incidents at Sea Agreement (1972)

Prevention of Dangerous Military Activities (1989)

International Code of Conduct Against Ballistic Missile Proliferation (2002)

Proliferation Security Initiative (2003)



## KEY ELEMENTS OF A SPACE CODE OF CONDUCT

### YES

Creating special caution areas in space  
Avoiding collisions in space  
Avoiding dangerous maneuvers in space  
Debris mitigation and reduction  
Cooperative traffic management  
Registration and notification of launches

### NO

Flight-testing of space weapons  
Deployment of space weapons  
Simulated attacks in space  
Harmful use of lasers



*Why is a Code of Conduct for space-faring nations needed?*

Because agreed rules can make us safer and better off by promoting national security and global commerce. Agreed rules also make it easier to identify and build coalitions against those who choose to violate them.

*But rules do not matter to bad actors.*

And laws are frequently broken. That doesn’t make the laws irrelevant or unimportant. Rules still matter. We also need to take action against rule breakers.

*How do we punish rule breakers if we can’t send police to outer space?*

The United States is the strongest nation on Earth. We don’t have to go into space to punish rule breakers.

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## SPACE ASSURANCE OR SPACE DOMINANCE? THE CASE AGAINST WEAPONIZING SPACE

BY MICHAEL KREPON WITH CHRISTOPHER CLARY



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## ABOUT THE CENTER

The Henry L. Stimson Center works to promote practical, creative, non-partisan solutions to challenging problems of national and international security. The Center is a non-profit public policy think tank with core areas of competence in reducing threats from weapons of mass destruction, enhancing regional security, and strengthening institutions for national and international security.

## ABOUT THE PROJECT

The Space Security Project seeks to promote the peaceful uses of outer space and to avoid the flight-testing and deployment of space weapons. The Project also seeks to promote a Code of Conduct for responsible space-faring nations. Support for the project is provided by the John D. and Catherine T. MacArthur Foundation, the Ploughshares Fund, and the Secure World Foundation.