

Lash-up

Combat I

by Larry Bond, 1952–

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One

Unexpected Losses.

San Diego, California
September 16, 2010

Ray McConnell was watching the front door for new arrivals, but he would have noticed her anyway. Long straight black hair, in her late twenties, casually dressed but making jeans and a knit top look very good. He didn't know her, and was putting a question together when he saw Jim Naguchi follow her in. Oh, that's how she knew.

Ray stood up, still keeping one eye on the screens, and greeted the couple. The woman was staring at the wall behind Ray, and he caught the tail end of her comment. „...why you're never at home when I call.“

Jim Naguchi answered her, „Third time this week,“ then took Ray's offered hand. „Hi, Ray, this is Jennifer Oh. We met at that communications conference two weeks ago—the one in San Francisco.“

As Ray took Jennifer's hand, she said, „Just Jenny, please,“ smiling warmly.

„Jenny's in the Navy, Ray. She's a computer specialist...“

„Which means almost anything these days,“ McConnell completed. „Later we'll try to trick you into telling us what you really do.“

Jenny looked a little uncomfortable, even as she continued to stare. Changing his tone a little, Ray announced, „Welcome to the McConnell Media Center, the largest concentration of guy stuff in captivity.“

„I believe it,“ she answered. „Those are Sony Image Walls, aren't they? I've got a twenty-four-incher at home.“

McConnell half turned to face the Wall. „These are the same, still just an inch thick. But larger,“ he said modestly.

„And four of them?“ she said.

Every new guest had to stop and stare. The living room of Ray's ranch house was filled with electronic equipment, but the focus of the room was the four four-by-eight flat-screen video panels. He'd removed the frames and placed them edge to edge, covering one entire wall of his living room with an eight-foot-by-sixteen-foot video screen—"the Wall".

Just then it was alive with flickering color images. Ray pointed to different areas on the huge surface. „We've set up the center with a map of the China-Vietnam border. We've got subwindows," Ray said, pointing them out, „for five of the major TV networks. That larger text subwindow has the orders of battle for the Vietnamese and Chinese and U.S. forces in the region.“

He pointed to a horseshoe-shaped couch in the center of the room, filled with people. „The controls are at that end of the couch, and I've got two dedicated processors controlling the displays.“

„So is this how the media keeps track of an international crisis?“ Jennifer asked.

„Maybe.“ Ray shrugged, and looked at Jim Naguchi, who also shrugged. „I dunno. We're engineers, not reporters.“

„With a strong interest in foreign affairs," she responded.

„True," he added, „like everyone else here.“ He swept his arm wide to include the other guests. Half a dozen other people watched the screens, talked, or argued.

„There's people from the military, like you, and professionals from a lot of fields. We get together at times like this to share information and viewpoints.“

„And watch the game," she added. Her tone was friendly, but a little critical as well.

„That window's got the pool on the kickoff times," Ray answered, smiling and indicating another area filled with text and numbers. „Most of the money is on local dawn, in"—he glanced at his watch—"an hour or so.“

„And I brought munchies," Naguchi added, holding up a grocery bag.

„On the counter, Jim, like always," Ray responded. One side of the living room was a waist-high counter, covered with a litter of drinks and snacks.

„It's my way of feeling like I have some control over my life, Jenny. If we know what's going on, we don't feel so helpless." He shrugged at his inadequate explanation. „Knowledge is Power. Come on, I'll introduce you around. This is a great place to network.“

Raising his voice just a little, he announced, „People, this is Jenny Oh. Navy. She's here with Jim.“ Everyone waved or nodded to her, but most kept their attention on the Wall.

McConnell pointed to a fortyish man in a suit. „That's Jim Garber. He's with McDonnell Douglas. The guy next to him is Marty Duvall, a C coder at a software house. Bob Reeves is a Marine.“ Ray smiled. „He's also the founding member of the *Why isn't it Taiwan?* Foundation.“

„I'm still looking for new members," the Marine answered. Lean, and tall even sitting down, with close-cropped black hair, he explained, „I keep thinking this is some sort of elaborate deception, and while we're looking at China's southern border, she's going to suddenly zig east, leap across the straits, and grab Taiwan.“

„But there's no sign of any naval activity west of Hong Kong," Jenny countered, pointing to the map. „The action's all been inland, close to the border. I'm not in

intelligence," she warned, „but everything I've heard say it's all pointed at Vietnam..."

„Over ten divisions and a hundred aircraft," Garber added. „That's INN's count this morning, using their own imaging satellites."

„But why Vietnam at all?" countered Reeves. „They're certainly not a military threat."

„But they are an economic one," replied Jenny. „They're another country that's trading communism for capitalism, and succeeding. The increased U.S. financial investment makes Beijing even more nervous."

Ray McConnell smiled, pleased as any host. The new arrival was fitting in nicely, and she certainly improved the scenery. He walked behind to the counter into the kitchen and started neatening up, trashing empty bags of chips and soda bottles. Naguchi was still laying his snacks on the counter.

„She's a real find, Jim," McConnell offered. „Not the same one as last week, though?"

„Well, things didn't work out," Naguchi admitted. „Laura wanted me to have more space. Like Mars." He grinned.

„Where's she stationed?"

„All she'll tell me is NAVAIR," Naguchi replied. „She knows the technology, and she's interested in defense and the military."

„Well, of course, she's in the business," McConnell replied. „She's certainly involved in the discussion." Ray pointed to Jenny, now using the controls to expand part of the map.

„That's how we met," Naguchi explained. „The Vietnam crisis was starting to heat up, and everyone at the conference was talking about it between sessions, of course. She was always in the thick of it, and somewhere in there I mentioned your sessions here."

„So *this* is your first date?" Ray grinned.

„I hope so," Naguchi answered hopefully. „I'm trying to use color and motion to attract the female."

„Ray! You've got a call." A tall African-American man was waving to Ray. McConnell hurried into the living room, picked up the handset from its cradle, and hit the VIEW button. Part of the Wall suddenly became an image of an older man, overweight and balding, in front of a mass of books. Glasses perched on his nose, seemingly defying gravity. „Good ... evening, Ray."

„Dave Douglas. Good to see you, sir. You're up early in the morning." The United Kingdom was eight hours ahead of California. It was five in the morning in Portsmouth.

„Up very late, you mean. I see you've one of your gatherings. I thought you'd like to know we've lost the signals for two of your GPS satellites."

Naguchi, who'd moved next to Jennifer, explained. „Mr. Douglas is head of the Space Observer Group. They're hobbyists, mostly in Britain, who track satellites visually and electronically. Think high-tech bird-watchers."

„I've heard of them," she answered, nodding, „and of Douglas. Your friend knows *him*?" She sounded impressed.

Naguchi replied, „Ray's got contacts all over."

Jennifer nodded again, trying to pick up the conversation at the same time.

„...verified Horace’s report about an hour ago. It was number seventeen, a relatively new bird, but anything mechanical can fail. I normally wouldn’t think it worth more than a note, but then Horace called back and said another one’s gone down as well, and quite soon after the first one.“

„Why was Horace looking at the GPS satellite signals?“ McConnell asked.

„Horace collects electronic signals. He’s writing a piece on the GPS signal structure for the next issue of our magazine.“

Ray looked uncertain, even a little worried. „Two failures is a little unusual, isn’t it?“ It was a rhetorical question.

Douglas sniffed. „GPS satellites don’t fail, Raymond. You’ve only had two go down since the system was established twenty-five years ago. By the way, both satellites are due over southern China in less than an hour.“

Ray could only manage a „What?“ but Douglas seemed to understand his query. „I’m sending you a file with the orbital data for the constellation in it. I’ve marked numbers seventeen and twenty-two. They’re the one’s who’ve failed.“ He paused for a moment, typing. „There ... you have it now.“

„Thank you, Dave. I’ll get back to you if we can add anything to what you’ve found.“ Ray broke the connection, then grabbed his data tablet.

While McConnell worked with the system, speculation filled the conversation. „...so we turned off two of the birds ourselves. Deny them to the Chinese,“ Reeves suggested.

„If so, why only two?“ countered Jenny.

„And the most accurate signal’s encrypted anyway,“ added Garber. „The Chinese can only use civilian GPS.“

„Which still gives them an asset they wouldn’t otherwise have,“ reminded Reeves.

„Unless the Chinese have broken the encryption,“ countered Duvall.

„But we need GPS even more,“ said Garber. „It’s not just navigation, it’s weapons guidance and command and control.“

Jennifer added, „All of our aircraft mission planning uses GPS now. If we had to go back, it would be a lot harder to run a coordinated attack. We could never get the split-second timing we can now.“

„Here’s the orbital data,“ McConnell announced.

The smaller windows on the Wall all vanished, leaving the map showing southern China and Vietnam. A small bundle of curved lines appeared in the center, then expanded out to fill the map, covering the area with orbital tracks. As Ray moved the cursor on his data pad, the cursor moved on the map. When it rested on a track, a tag appeared, naming the satellite and providing orbital and other data. Two of the tracks were red, not white, and were marked with small boxes with a time in them.

„Where are the satellites right now?“ someone asked.

Ray tapped the tablet and small diamonds appeared on all the tracks, showing their current positions.

„Can you move them to where they’d be at local dawn for Hanoi?“ suggested Garber.

„And what’s the horizon for those satellites at Mengzi?“ Jennifer prompted, pointing to a town just north of the Chinese-Vietnamese border. „That’s one of the places the Chinese are supposed to be massing.“

„Stand by,“ answered Ray. „That’s not built in. I’ll have to do the math and draw it.“ He worked quickly, and in absolute silence. After about two minutes, an oval drawn in red appeared on the map, centered on the location. Everyone counted, but Ray spoke first. „I count three.“

„...and you need four for a fix,“ finished Naguchi.

National Military Command Center, The Pentagon September 17

„...and without the GPS, General Hyde had to issue a recall.“ The assistant J-3 looked uncomfortable, as only a colonel can look when giving bad news to a room full of four-star generals.

The meeting had originally been scheduled to review results of the first day’s strikes in Operation CERTAIN FORCE. A total of eighty-three targets in China had been programmed to be hit by 150 combat aircraft and almost two hundred cruise missiles. It hadn’t happened.

„The gap in coverage was only twenty minutes,“ Admiral Kramer complained. „Are we so inflexible that we couldn’t delay the operation until we had full coverage?“

„It would have meant issuing orders to hundreds of units through two levels of command,“ answered General Michael Warner. Chief of Staff of the Air Force, it was one of his men, General Tim Hyde, who was Joint Task Force Commander for CERTAIN FORCE. Warner, a slim, handsome man whose hair was still jet-black at sixty, looked more than a little defensive.

„Sounds like *set-piece-itis* to me,“ muttered the Army Chief of Staff.

The Chairman, also an Army general, shot his subordinate a „this isn’t helping“ look and turned back to Warner. The Air Force, through the Fiftieth Space Operations Wing, operated the GPS satellites.

„Mike, have your people found out anything else since this morning?“

„Only that both birds were functioning within norms. Number seventeen was the older bird. They’d recently fired up the third of her four clocks, but she was in good shape. Number twenty-two was still on her first atomic clock. All attempts to restart them, or even communicate with them, have failed. Imaging from our telescopes shows that they’re still there, but they’re in a slow tumble, which they shouldn’t be doing...“

„And the chance of both of them suffering catastrophic failure is nil,“ concluded the Chairman.

„Yes sir. The final straw is that we started warm-up procedures on the two reserve birds twenty-eight and twenty-nine. Or rather, we tried to warm them up. They don’t answer either.“

General Sam Kastner, Chairman of the Joint Chiefs, was a thinker, more a listener than a speaker, but he knew he had to take firm charge of the meeting. He sighed, knowing the answer before he started, „What about Intelligence?“

The J-2, or Joint Intelligence officer, was a boyish-looking rear admiral. His normal staff was two or three assistants, but this time he had a small mob of officers and civilians behind him. The admiral moved to the podium.

„Sir, the short answer is that we don't know who did this or how. If we knew who, we could start to guess how they did it. Similarly, knowing how would immediately narrow the list of suspects.

„We know that the DSP infrared satellites detected no launches, and we believe that they also would have detected a laser powerful enough to knock out a GPS bird—although that's not a certainty,“ he added quickly, nodding to an Army officer with a stern expression on his face.

„The Chinese are the most likely actors, of course, but others can't be ruled out. CIA believes the attack was made by agents on the ground or in cyberspace, but we've detected no signs of this at any of the monitoring stations. The Navy believes they've adapted their space-launch vehicles for the purpose. Although it's a logical proposition, we've seen no sign of the launch, or the considerable effort it would require. And we track their space program quite closely.“

The frustration in his voice underlined every word. „It's possible that the Russians or someone else is doing it to assist the Chinese, but there aren't that many candidates, and we've simply seen no sign of activity by any nation, friendly or hostile.“ He almost threw up his hands.

„Thank you, Admiral,“ replied Kastner. „Set up a Joint Intelligence Task Force immediately. Until we can at least find out what's being done, we can do nothing, and that includes reliably carry out military operations. Spread your net wide.“

He didn't have to say that the media were also spreading their net. Television and the Internet were already full of rumors—the attack had been scheduled but called off for political reasons, that the entire exercise was just a bluff, that the U.S. had backed down because of the risk of excessive casualties, and others more fanciful. U.S. „resolve“ had been shattered.

Gongga Shan Mountain Launch Complex, Xichuan Province, Southern China September 23

General Shen Xuesen stood quietly, calmly, watching the bank of monitors, but wishing to be on the surface. He had a better view of the operation from here, but it did not seem as real.

It was their fifth time, and he could see the staff settling down, nowhere as nervous as the first launch, but China was committed now, and her future hung on their success.

Everyone saw the short, solidly built general standing quietly in the gallery. In his early fifties, he'd spent a lot of time in the weather, and it showed. An engineer, he looked capable of reshaping a mountain, and he had Gongga Shan as proof. It was a commander's role to appear calm, even when he knew exactly how many things could go wrong, and how much was at stake, both for him and for China.

Shen had already given his permission to fire. The staff was counting down, waiting until they were in the exact center of the intercept window. The „Dragon’s egg“ sat in the breech, inert but vital, waiting for just a few more seconds.

The moment came as the master clock stepped down to zero. The launch controller turned a key, and for a moment, the only sign of activity was on the computer displays. Shen’s eyes glanced to the breech seals, but the indicators all showed green. He watched the video screen that showed the muzzle, a black oval three meters across.

Even with a muzzle velocity of four thousand meters per second, it took time for the egg to build up to full speed. Almost a full second elapsed between ignition and...

A puff of smoke and flame appeared on the display, followed by a black streak, briefly visible. Only its size, almost three meters in diameter, allowed it to be seen at all. Shen relaxed, his inward calm now matching his outward demeanor. His gun had worked again.

„Hatching,“ reported the launch controller. Everyone had so loved the egg metaphor that they used the term to report when the sabots separated from the meter-sized projectile. Designed to hold the small vehicle inside the larger bore, they split and fell away almost instantly. Effectively, the projectile got the boost of three-meter barrel but the drag of a one-meter body.

Speed, always more speed, mused Shen as he watched the monitors. The crews were already boarding buses for their ride up the mountain to inspect the gun. Other screens showed helicopters lifting off to search for the sabots. Although they could not be used again, they were marvels of engineering in their own right and would reveal much about the gun’s design.

The goal was eight kilometers a second, orbital velocity. First, take a barrel a kilometer long and three meters across. To make it laser-straight, gouge out the slope of a mountain and anchor it on the bedrock. Cover it up, armor and camouflage it, too. Put the muzzle near the top, seventy-nine hundred meters above sea level. That reduces air resistance and buys you some speed. Then use sabots to get more speed. You’re halfway there. Then...

„Ignition,“ announced one of the controllers. Put a solid rocket booster on the projectile to give it the final push it needed. „She’s flying! Guidance is on-line, sir. It’s in the center of the basket. Intercept in twenty minutes.“

General Shen had seen the concept described in a summary the Iraqis had provided of Supergun technology after the American Persian Gulf War. American technological superiority had been more than a shock to the People’s Liberation Army. It had triggered an upheaval.

The Chinese military had always chosen numbers over quality, because numbers were cheap, and the Politburo was trying to feed one and a half billion people. They’d always believed that numbers could overwhelm a smaller high-tech force, making them reluctant even to try. Everyone knew how sensitive the Americans were to casualties, and to risk.

But if the difference in quality is big enough, numbers don’t matter anymore. Imagine using machine guns in the Civil War, or a nuclear sub in WWII. Shen and his colleagues had watched the Americans run rings around the Iraqis, suffering trivial casualties while they hammered the opposition.

So the Chinese army had started the long, expensive process of becoming a modern military. They'd bought high-tech weapons from the Russians, fortunately willing to sell at bargain-basement prices. They'd stolen what they couldn't buy from Western nations. They'd gotten all kinds of exotic technologies: rocket-driven torpedoes for their subs, exotic aircraft designs.

It wasn't enough. Running and working as hard as they could, they'd cut the technology lag from twenty to fifteen years. They were following the same path as the West, and it would just take time to catch up.

General Shen had seen the answer. He'd seen a vulnerability, then planned, convinced, plotted, and argued until the Politburo had listened and backed his plan. If your opponent strikes at you from above, take away his perch. Take away that technological edge.

Build a prison camp deep in the mountains, in a remote spot in southern China. Send the hard cases and malcontents there. The State has useful work for them. Watch the prisoners dig away the side of a mountain. You need a rail line to the nearest city, Kangding, 250 kilometers southwest. That had been a job in itself. Then add army barracks, the launch-control center, and SAM and AAA defenses. It had taken years before it looked like anything more than a mistake.

Meanwhile, design the *T'ien Lung*, or Celestial Dragon, to fly in space. And design a gun, the biggest gun in the history of the world, the Dragon's Mother, to fire it. Such designs were well within the grasp of the West, but they were barely possible for China's limited means. Her civilian space program had provided a lot of the talent, as well as a convenient excuse for foreign study and purchases.

„Control has been passed to Xichuan,“ the senior controller announced. „Intercept in ten minutes.“ A look of relief passed over his face. If a screwup occurred after this, it was their fault, not his.

Shen longed to be in two places at once, but the gun was his, and Dong Zhi, the scientist who had actually designed the Dragons, was at the space complex. Xichuan handled China's civilian space program, and they had the antennas to watch the intercept.

Everyone in the room watched the central display, even though it was only a computer representation. Two small dots sat on curved lines, slowly moving to an intersection point. Then the screen changed, becoming completely black, with the characters for „Terminal Phase“, displayed in one corner.

General Shen Xuesen smiled. He had insisted on the television camera for terminal-phase guidance. Not only was it hard to jam, it made the result understandable. Seeing the target grow from a speck to a shape to a recognizable satellite had made it real, not only for the leadership who had watched the tests, but for the people who had to do the work, who fought the war from so far away.

The image was a little grainy, because of the lens size, but it also had the clarity of space. He could see the boxy, cluttered body of the American GPS satellite, and the outspread solar panels, each divided into four sections.

The controller started counting down as the image slowly expanded. „Five seconds, four, three, two, one, now.“ He uttered the last word softly, but triumphantly, as the image suddenly vanished. A few people clapped, but they'd all seen this before, and most didn't feel the need now.

All that work, all that money, to put a ten-pound warhead in orbit. More like a shotgun shell, the explosive fired a cone of fragments at the unarmored satellite. Filled with atomic clocks and delicate electronics, it didn't have a hope of surviving the explosion. The carcass would remain in its orbit, intact, but pocked with dozens of small holes.

In fact, the kill was almost an anticlimax. After all the work of getting the vehicle up there, it was over far too quickly.

Skyhook One Seven, Over the South China Sea September 23

„We just lost GPS,“ reported the navigator. „Switching to inertial tracker.“ The navigator, an Air Force major, sounded concerned but not alarmed.

„Is it the receiver?“ asked the mission commander. A full colonel, it was his job to manage the information gathered by the ELINT, or Electronic Intelligence, aircraft. Running racetracks off the China coast, it listened for radar and radio signals, analyzing their contents and fixing their location. The digested information was datalinked directly back to Joint Task Force Headquarters.

„Self-test is good, sir, and the receiver is still picking up satellites, but we just lost one of the signals, and now we're outside our error budget.“ Each satellite over the minimum required narrowed the area of uncertainty around a transmitter's location. GPS was accurate enough to target some missiles directly, or give pilots a good idea of where to search for their objective.

„So we've lost another one,“ muttered the colonel.

USS NEBRASKA (SSBN—739), On Patrol September 24

The sub's Operations Officer knocked on the captain's open door. „Sir, they've lost another one.“ He handed the priority message to the skipper. It detailed the loss and showed how coverage was affected for their patrol area.

The captain looked over the printout. „Have you compared this with our navigation plan?“

„Yes, sir. We have to change one of our planned fix times. It falls in one of the new *dark windows*. We can move it ahead two hours or back six.“

The captain scowled, more than one might think appropriate for a minor inconvenience. But ballistic missile subs had to come up to periscope depth periodically to check their navigation systems' accuracy. A few meters of error at the launch point could be hundreds of times that at the target.

When the full GPS constellation had been operational, the captain could take a fix anytime he chose. Now there were times he couldn't. That made him less flexible, more predictable, and thus easier to find. He really didn't like that.

„Move it up,“ ordered the captain. „Let's take a fix before they lose any more birds. And draw up a new schedule reducing the interval between fixes.“

INN News September 24

„With the loss of another satellite, emotions at the Fiftieth Space Operations Wing have changed from grim or angry to fatalistic.“ Mark Markin, INN’s defense correspondent, stood in front of the gate to Cheyenne Mountain. The Fiftieth’s operations center was actually located at Schriever Air Force Base nearby, but the drama of the mountain’s tunnel entrance was preferable to Schriever’s nondescript government buildings.

Markin wore a weather-beaten parka, zipped up against the chill Colorado wind. His carefully shaped hair was beginning to show the effects of the wind as well, and he seemed to rush through his report in an effort to get out of the weather.

„Although it is widely acknowledged that loss of the GPS satellites is no fault of the people here at the Fiftieth, they are still suffering a deep sense of helplessness.

„Since the GPS network became active in 1989, it has become almost a public utility. The men and women here took pride in providing a service that not only gave the U.S. armed forces a tremendous military advantage, but benefited the civilian community in countless ways.

„Now, someone, possibly the Chinese, but certainly an enemy of the United States, has destroyed at least three and possibly as many as five satellites. Yesterday’s loss shows that last week’s attack was not an isolated act.

„And the United States can do nothing to stop it.“

San Diego, California September 24

Jim Avrell had gone to only a few of Ray’s gatherings. His „discussion groups“ were famous throughout SPAWAR, and were always worthwhile. Although Avrell would have liked to go, two preschoolers and another on the way limited his free time.

Tonight, though, he’d made the time. In fact, his wife Carol had urged him to go. After he’d described Ray’s sudden leave of absence and the rumors from the other coworkers, she’d urged him to go and get the straight story.

Avrell was an antenna design specialist in Ray’s working group. He knew and liked the outgoing engineer, even if McConnell could be a little fierce in technical „discussions“. He was worried about their project, which was suffering in Ray’s absence, and about Ray himself. With the brass so upset about GPS, it was no time for Ray to play „missing person“.

The car’s nav console prompted, „Turn left here,“ and he signaled for the turn onto Panorama Drive. It had been over a year since he had visited Ray’s place, that time with Carol at a reception for a visiting astronaut. That had been an occasion.

But nothing like this. As he made the turn, Avrell saw the street almost completely lined with cars. This was definitely not typical for a quiet residential community. Avrell ended up parking a block away.

As he hurried up the path, he heard the expected hubbub, but Ray didn't meet him at the door, and everyone wasn't in the living room. A group of four men huddled around a coffee table there, and he could see another clustered in the kitchen. McConnell appeared out of the one of the bedroom doors, hurrying. He looked tired.

„Jim Avrell! It's great to see you.“ Genuine pleasure lit up Ray's face, but there was a distracted air to it. And surprise.

Avrell saw no point in dissembling. „Ray, what's going on over here? You haven't been at work...“

„I've got bigger fish to fry, Jim. Promise you won't tell anyone what's going on here? Unless I OK it?“

„Well, of course.“

Ray looked at him intently. „No, Jim, I mean it. You can't tell anyone. Treat this as classified.“

Avrell studied McConnell carefully, then agreed. „I promise not to tell anyone what I see here.“ He fought the urge to raise his right hand.

McConnell seemed to relax a little, and smiled again. „You'll understand in a minute, Jim.“ He called over to the group at the coffee table. „I'll be right there.“

One of them, whom Avrell recognized as Avrim Takir, a mathematician from the work group, answered. „Fine, Ray. We need another ten minutes, anyway.“ Takir spotted Avrell and waved, but quickly returned his attention to the laptop in front of him.

McConnell led his coworker down the hall into his home office. Ray's desk was piled high with books and disk cases and printouts. The center display, another Image Wall mounted above the desk, showed an isometric design for an aircraft—no, a spacecraft, Avrell realized.

Used to polished CAD-CAM designs where they worked, he was surprised. This one was crude. Some of it was fully rendered in 3-D space, but parts of it were just wireframes. At least one section was a two-dimensional image altered to appear three-dimensional.

„*Defender* isn't pretty, but we're a little pressed for time,“ McConnell declared. He had the air of a proud parent.

Avrell, surprised and puzzled, studied the diagram, which filled the four-by-eight display. Data tables hovered in parts of the screen not covered by the vehicle. He started tracing out systems: propulsion; communications; weapons? He shot a questioning look at McConnell.

Ray met his look with one of his own. „Question, Jim. What's the best way to protect a satellite? If someone's shooting them down, how can you stop them?“

„They haven't even confirmed it's the Chinese...“

„Doesn't matter who's doing it!“ McConnell countered. „Someone is.“ He paused and rephrased the question. „Can you effectively protect a satellite from the ground?“

Avrell answered quickly. „Of course not. You're on the wrong end of the gravity well, even if you're near the launcher site, and you might be on the wrong side of the planet.“

„Which we probably are,“ McConnell agreed. „Here on the surface, even with perfect information, we can't defend a satellite until something is launched to

attack it, so we're always in a tail chase. If we're above the launcher, with the satellite we're trying to defend, Isaac Newton joins our team."

"And this is going to do the job?" Avrell asked, motioning toward the diagram. He tried to sound objective, but skepticism crept into his voice in spite of his efforts.

McConnell seemed used to it. "It can, Jim. There's nothing startling in here. The technology is all there: an orbital vehicle, sensors, and weapons."

"And you've been tasked by..."

"It's my own hook, Jim. This is all on my own," Ray admitted. Then he saw his friend's question and answered it without waiting.

"Because I can't wait for the government to think of it, that's why. The answer is obvious, but by the time they hold all the meetings and write all the Requirements we won't have any satellites left."

McConnell sat down heavily, fatigue and strain showing on his face. "This isn't about just GPS or the Chinese, Jim. Someone's developed the capability to attack satellites in space. That means they could attack manned spacecraft. They can probably launch orbital nuclear weapons at us, or anyone else they don't like. And we certainly know they don't like us."

Avrell leaned back against the edge of a table and looked carefully at Ray. "So you're going to design the answer to our problems." He phrased it as a statement, but it was still a question.

"Me and all the other people here," Ray corrected. "Why not, Jim? I've got a good idea, and I'm running with it. I might not be in the right bureau in the right branch, but I believe in this. Ideas are too precious to waste."

Inside, Avrell agreed with his friend, but practicality pushed that aside. "You can't build it," he stated quietly.

"Well, that's the rub," McConnell said, actually rubbing the back of his neck in emphasis. "I've made a lot of friends over the years. I'm going to shotgun it out—only within the system," he hurriedly added, referring to the procedures for handling classified material. "I won't go public with this. It's a serious design proposal."

"Which needs a Requirement, a contractor, and research and development..."

"And congressional hearings and hundreds of man-hours deciding what color to paint it," continued McConnell. "A small group can always move faster and think faster than a large one. I want to present the defense community with a finished design, something so complete they'll be able to leapfrog the first dozen steps of the acquisition process." He grinned. "We can skip one step already. The other side's writing the Requirement for us."

Ray stood and turned to face Avrell directly. "I know I'm breaking rules, but they're not rules of physics, just the way DoD does business. I'm willing to push this because it needs to be done, and nobody else is doing it."

Avrell sighed. "So who's working on your comm system?"

McConnell grinned. "The guys in the kitchen, but they've got almost all the electronics. There's lots to do. Come on, I'll introduce you..."

"Wait a minute, Ray." Avrell held up his hand. "Let me make a call first."

"Carol?"

"No. Sue Langston. She's in graphics."

Ray laughed and pointed to the phone. Heading out of the office and down the hall, his intention was to check with the propulsion group in the living room, but then he heard the doorbell again. Fighting impatience, he hoped for another volunteer, or the Chinese takeout he'd ordered.

Jennifer Oh stood on the doorstep, and Ray blinked twice in surprise. Another unexpected caller.

„Can I come in?“ she finally asked.

„Oh, certainly, please come in, Jenny,“ trying to sound as hospitable as he could. His distraction increased. She'd obviously come straight from work, and her naval uniform, with lieutenant commander's stripes, jarred after the casual outfit he'd seen her in last week. Her long black hair was tied up in an ornate bun.

She didn't wait for him to speak. „Jim Naguchi told me a little about what you're doing here. I think it's an incredible idea.“ She held up three square flat boxes. „And I brought pizza.“

„Thank you on both counts, Jenny. Jim's not here tonight, though.“

„I came to help you, Ray. I can see what you're doing. I've got a lot of experience in command and control systems,“ she offered.

Ray suddenly felt that *Defender* was going to work.

Two

Suggestions.

National Military Command Center, The Pentagon September 25

The Joint Chiefs of Staff didn't normally meet at two in the morning, but Rear Admiral Overton's call was worth getting out of bed for.

Most of the Chiefs had been in the Pentagon anyway, trying to manage the crisis, the troops, and the media. Although only three active GPS satellites had been lost out of a constellation of twenty-four, it had still created periods when there was no coverage in some parts of the world at some times, and there was no indication that they'd be able to fill the gaps soon. Everyone was assuming it would get much worse before it got better.

There was also the continuing problem of the Vietnam Crisis. U.S. forces could not execute a coordinated, precision attack without complete GPS coverage, but they could not maintain such high readiness levels forever. And what if China had started attacking American satellites? Had a war already started?

As they hurried into the Command Center, the J-2, Frank Overton, compared the generals' normal polished appearance with the tired, overworked men in front of him. He was glad he had good news.

The Chief of Staff of the Air Force and the Chief of Naval Operations were both last, coming in together and breaking off some sort of disagreement as they walked through the door. Overton didn't even wait for them to sit down.

„We have proof it's the Chinese. We figured out where, and that led to how,“ he announced.

Overton's data pad and the screen at the head of the table showed a black-and-white satellite photo. A date in the corner read „Jun 2006“.

„This is the Gongga Shan prison camp in southern China—at least, we had identified it as a prison camp. We named it after the mountain.“ Using his pointer, he showed areas marked as „Prisoners' Barracks, Guard Barracks“, and so on. „As far as we know, it was built about five years ago, and can accommodate several thousand prisoners.“

He pressed the remote again, and the first image slid to one side, and a second, of the same area, appeared alongside it. „This was taken about six hours ago. This construction work“—he indicated a long scar on the side of the mountain in the first photo—„has been finished or just stopped. We think finished, because if they'd just abandoned it, the excavation would still be there. In fact, if you look in the second photo, the mountain's been restored to its original state. The original analysis four years ago speculated that the prisoners might be mining, or building an observatory, or an antenna. The site goes right up to the top of the mountain, and it's one of the tallest around.“

Admiral Overton paused, looking at the group. A hint of embarrassment appeared on his face. „That analysis was never followed up.“ He shrugged.

General Kastner spoke for the group. „And the real answer is?“

Overton pressed the remote again. A gray-green infrared image appeared, superimposed over the second photo. „We wanted to see what they'd been working on. This is a satellite infrared picture taken about an hour ago. We were lucky,“ he explained. „There was one already tasked to cover the region because of the crisis.“

Most of the shapes in the image duplicated the buildings and other structures, but one shape was unique: a long, thick, straight line, laid east-west along the spine of the mountain.

„It's one kilometer long, and based on careful measurements, we know it's angled along the western face of the mountain at about forty degrees elevation. At the base you'll see a series of buried structures, including what we think are several bunkers for the launch crew. The buildings at the base are warm, and the entire structure is slightly warmer than the surrounding rock. We think it's made of metal.“

„A buried rocket launcher?“ wondered the Army Chief of Staff.

„No, sir. A buried gun barrel. See these shapes?“ He used the cursor to indicate two round structures. „We believe these are tanks for the liquid-propellant fuel. Here where the barrel widens is the breech and combustion chamber.“

„The barrel looks to be about ten feet in diameter. We're still working on the numbers, but I believe it's capable of launching a boosted projectile into earth orbit.“

Even while the generals and their staffs took in the news, Kastner replied, „Great job, Frank. We're pressed for time, but I've got to know how you found this.“

„We're putting together a complete report right now, sirs; you'll all have it in a few hours.“ He paused for a moment, then said, „Elimination and luck. Two of our satellites were killed in the same area just east of Okinawa. We assumed a west-

to-east trajectory, back-calculated the origin, and tried to find a launching site in the region. We got lucky because we figured they'd start with an established installation, and the Gongga Shan Prison Camp was on the list. It probably never was anything but a construction site for the gun. That still took us over a week." He didn't sound proud.

Kastner was complimentary but grim. „Well, Frank, your work is just beginning. We need to know a lot more about this weapon. First, is this the only one? It probably is, but I've got to know absolutely. How many more satellites can they kill with it? And what would it take to stop it?“

Overton nodded silently, as grim as the general. He and his staff quickly left.

Kastner turned to the others. „Immediate impressions, gentlemen? After we finish here, I'll wake the President.“

INN News, September 25

Mark Markin stood in front of a map of China and Vietnam, a familiar image after weeks of confrontation. He read carefully from a data pad.

„Xinhua, the official Chinese News Service, today released a statement claiming a victory over *an American plan to seize control of Southeast Asia.*“

Markin's image was replaced by Chinese Premier Li Zhang, speaking to a crowd of cheering citizens. Thin, almost scrawny, the elderly leader spoke with energy in Chinese. English subtitles appeared at the bottom of the image.

„In response to preparations for a massive attack on Chinese territory, the forces of the People's Liberation Army have hamstrung the Imperialist aggressor by shooting down his military satellites.

„Deprived of his superiority and given pause by our new technological strength, the Americans have canceled their attack plan. This shows that America is not all-powerful, that any bully can be stopped if one faces him directly and exposes his inner weakness.

„We call on all the nations of the world, oppressed and suffering under American world hegemony, to topple the corrupt giant.“

Markin reappeared, looking concerned. „U.S. defense officials have refused to comment officially, but it has been a working assumption that the Chinese were responsible for the missing spacecraft. They also were unable to say how or when U.S. military forces would react to this news.

„Sources at the State Department were slightly more forthcoming, but only about the reasons for the Chinese announcement. They believe that the Chinese are openly challenging the U.S. in a field the Americans consider theirs exclusively: their technical edge. They hope to leverage their victory into an alliance of nations opposed to American policy.

„There was no comment from the White House, except that the President and his advisors are considering all options to protect American interests in this widening crisis.“

China Lake Naval Weapons Center, California September 26

Tom Wilcox worked in the Test and Evaluation shop at China Lake. The entire base's mission was to evaluate new weapons systems for the Navy, but his shop was the one that did the dirty work. He spent a lot of time in the desert and would be out there at dawn, half an hour from now.

Wilcox looked like someone who's spent a lot of time on the desert. Lean, tanned, his face showed a lot of wear, although he would joke that was just from dealing with the budget. He'd been in his current job for twenty-five years, and claimed he was good for that many more.

This morning, he had to inspect the foundations for a new test stand. Before too long they'd be mounting rocket motors on it, and he didn't want a motor, with stand still attached, careening across the landscape.

First, though, he always checked his e-mail. Working on his danish, and placing his coffee carefully out of the way, he said, „New messages“.

The computer displayed them on his wall screen, a mix of personal and professional subjects listed out according to his own priority system. The higher the rank of the sender, the less urgent the message had to be. Anything from an admiral went straight to the bottom of the pile.

He noted one unusual item. Ray McConnell had sent a message, with a medium-sized attachment. He'd known Ray for quite a while as a colleague, but he hadn't seen him since Wilcox had been to SPAWAR for that conference last spring, about six months ago. They'd exchanged some notes since then.

Wilcox noted that it had a long list of other addressees, and it had been sent out at four this morning. He recognized a few of the addressees. They were all at official DoD installations.

The cover letter was brief: „I think you'll know what to do with this. It's completely unclassified, but please only show it to people inside the security system. Thanks.“

Well, that was mysterious enough to be worth a few minutes. He downloaded the attached file, waited for the virus and security check sums to finish, then had a look.

It was a hundred-page document. The cover page had a gorgeous 3-D-rendered image of a wedge-shaped airfoil. It had to be a spacecraft, and the title above it read, „Defender“.

Wilcox's first reaction was one of surprise and disappointment. He almost groaned. Engineers in the defense community receive a constant stream of crackpot designs from wanna-be inventors. The unofficial ones were ignored or returned with a polite letter. The official ones, that came through a congressman or some other patron, could be a real pain in the ass. Why was Ray passing this on to him?

Then he saw the name on the front. It was Ray's own design! *What is this? It's not an official Navy project. McConnell must have put some real time into this, and he's no flake*, thought Wilcox. *Or at least, not until now.*

He opened the cover and glanced at the introduction. „The Chinese attack on our satellites is the beginning of a new stage of warfare, one that we are completely

unprepared for. Even if the source of the attacks is found and destroyed, the technology now has been demonstrated. Others, hostile to U.S. interests, will follow the Chinese example.

„*Defender* is a vehicle designed to protect spacecraft in orbit from attack. It uses proven technology. Please consider this concept as an option to protect our vital space assets.“

Below that was a long list of names, presumably people who either endorsed the idea or who had helped him with the design. Wilcox scanned the list. They were helpers. He didn't recognize any of the names, and there were none with a rank attached.

He skimmed the document, watching the clock but increasingly absorbed in the design. Ray had done his homework, although his haste was obvious. At least the art was good. Diagrams were important for the higher-ups. They had problems with numbers and large words.

The phone rang, and Wilcox picked it up. „We need you in five,“ his assistant reminded him.

„I'll be there,“ Wilcox replied, and hung up.

He sat for another ten seconds, thinking and staring at the screen. *All right, Ray's got a hot idea, and he wants to share it. In fact, Wilcox realized, he wants me to share it, to send it up the line. He's trying to jump-start the design process.*

Wilcox knew, and so did anyone else who worked for the DoD, that it took millions of dollars and years of effort to produce a design like this, and that only happened after an elaborately crafted Requirement for such a design was issued by the Pentagon. The U.S. didn't have time for that kind of deliberate care.

Wilcox knew it was a good idea. The U.S. had no way of protecting their satellites.

Taking the few minutes it needed, he had the computer call up his address book and flagged ten names. Most were senior engineers, like him, but a few were military officers of senior rank. He wanted to see if they were still capable of recognizing an original idea when they saw it.

That morning, Ray had sent his document out to over thirty friends and colleagues. All had clearances, and all worked in some area of defense. By lunchtime, eight hours after its transmission, over 150 copies existed. By close of business, it was over five hundred and growing.

Crystal Square 3, Arlington, Virginia September 27

Captain „Biff“ Barnes was more than ready to leave for the day. His skills as a pilot were supposed to be essential for this project, but he spent most of the day wrestling with the Pentagon bureaucracy.

„Biff's“ name was Clarence, but he'd acquired the nickname, any nickname, as quickly as he could. He hated „Clarence“. Barnes was a little short, only five-eight, but average for a pilot. He kept in very good shape, counting the months and weeks until his desk tour was finished. His thin, almost angular face showed how

little fat he carried. His hair was cut as short as regulations would allow. The Air Force didn't like bald pilots, but he'd have shaved his head if he could.

He'd flown F-15s before being assigned to the Airborne Laser project. He understood the work was important, but doing anything other than flying was a comedown. He'd been promised a billet in an F-22 squadron once this tour was complete.

His job was interesting, when he actually got to do it. He had to determine, as accurately as possible, how vulnerable aircraft were to laser attack. He'd gotten to look at a lot of foreign hardware up close, and his degree in aeronautical engineering was proving quite useful.

But most of the time he futzed with the system. Some congressman wanted to be briefed on the status of the project. That was easy. Some other agency didn't want to provide information he needed. That took some doing. The General Accounting Office wanted to review their phone records. Or some reporter on a fishing expedition filed a Freedom of Information Act request. That had to be dealt with immediately.

Because the project was classified, and only a limited number of people could be cleared into the program, everyone involved had to do double or triple duty. The junior troops, like Barnes, drew most of the nasty ones.

He couldn't have dodged the latest flap, anyway. A government office concerned with equal opportunity needed to know if Barnes, who was African American, felt his „capabilities were being fully utilized,“ and had included a five-page form to fill out. He'd used all of the comments section to share his feelings about „utilization“.

He sat at his desk, closing up files and locking his safe, but still reluctant to go without something productive to show for his day. He checked his mail, at that point even willing to read Internet humor.

The page opened, and the first thing he noticed was another two copies of the *Defender* document, from separate friends at Maxwell and Wright-Pat. He'd gotten the first one yesterday morning from a pilot buddy at March Air Force Base in California, and another copy later in the day. He'd tabled it then, busy with paperwork, but his mind was ready for distraction now.

He opened the file and almost laughed when he saw the cover. Someone had taken the new VentureStar, a single-stage-to-orbit space vehicle, and tried to arm it, using „his“ laser. The introduction had touted it as a way of defending the GPS satellites.

A worthy goal, although Barnes had no expectation that this lash-up was anything more than a time-wasting fantasy. Still he was motivated by curiosity to see what this McConnell had said about the Airborne Laser.

Carried by a modified Boeing 747, the Airborne Laser could engage ballistic or cruise missiles, or even aircraft, at long range. Just what range was one of the problems Barnes was trying to solve. The prototype aircraft, which had been flying for several years, was still in test, proving not just the laser but the basic concept of engaging aircraft with a beam of light. How much did weather affect it? What if some country developed a cheap antilaser paint?

McConnell had taken the laser out of the 747 and mounted it in the cargo bay of the spacecraft. Barnes flipped to the section labeled „Laser Weapon“, and started to read. Whoever this McConnell was, thought Barnes, he didn't write

science fiction. He hadn't made any obvious mistakes, but he didn't have detailed information, which of course was classified. There certainly wasn't any weather in space. The laser would be much more effective in a vacuum.

But what about targeting? He started working through the document, answering questions and become increasingly impressed with McConnell's idea.

He knew about spacecraft, not only because of his degree but because he'd actually been selected for the Astronaut Corps after his first squadron tour. He'd flown one mission, but then left the program. He hated the constant training, the public relations. And what he really hated was the lack of flight time.

Barnes's stomach growled, and he looked up from the screen to see it was seven-forty-five. He'd missed the rush hour, anyway. Biff said, „Print file,“ and pages started to fill the hopper. He wanted to show this to his buddies.

Barnes pulled himself up short. His friends would be interested, but they didn't have security clearances, and the cover message had explicitly asked that it not be shown to anyone who wasn't cleared. Respect for the design made him want to respect the author's wishes, and treat it seriously.

The Vietnam Crisis, another Desert Storm/Balkans exercise in U.S. diplomacy, had suddenly transformed itself into a much wider challenge. McConnell proposed this Defender as an answer—maybe the only answer, since he hadn't heard of any others.

He looked at the proposal. Did he buy into it? He did, Biff realized. McConnell had gotten the laser right. He knew what he was doing.

Biff sat back down at the keyboard. He had some friends in high places.

U.S. Navy Space Warfare Command, San Diego, California September 27

Ray McConnell came back to his office and shut the door quickly. He was shaken, almost physically trembling, after his meeting with Admiral Carson.

Rear Admiral Eugene Carson was not just the head of Communications, which was Ray's division, but of the entire Space and Naval Warfare Systems Command. It had taken Ray two days to work his way up the chain, first with Rudy White, his own division head, then Dr. Krauss, the technical director, and Admiral Gaston. With increasing force, he'd made his case for *Defender*. His unsolicited, unrequired, unwanted proposal had been shown dozens of times.

Rudy White had been concerned with the lost time from Ray's assigned projects. „Why haven't you put some of that creative energy into the new communications system?“ he'd demanded.

„Because someone's shooting down GPS satellites right now,“ Ray had responded. He'd worked with White for years, and knew he could press his point. „I thought of this, but I can't build it, and it needs to be built, and soon.“

White had agreed to let McConnell see the technical director, with the strict understanding that the *Defender* proposal was Ray's own idea. White was relaxed enough about his career to take the risk.

Dr. Krauss had been even less helpful, wondering aloud if *Defender* was SPAWAR property, since a SPAWAR employee had created it. Ray had been

nonplussed, unsure whether Krauss was greedy or simply trying to cover his bureaucratic ass.

He'd decided to play the doctor's game. Krauss had been shocked when he heard about the several hundred copies of the proposal already circulating through the defense community.

„I'd be delighted to have official SPAWAR endorsement of *Defender*. I'm sure that would be all the help she needed.“ Ray fought hard to keep a straight face when he saw the look of horror. Krauss hadn't been able to get him out of his office quickly enough.

The vice commander had been the final hurdle, Ray thought. He'd been more than aware of *Defender's* popularity. „You realize that you have no credibility as a spacecraft design engineer,“ Gaston explained coolly. He'd been polite, but a little condescending.

„I didn't think I had to be qualified to have a good idea, sir.“

Gaston shook his head. „I disagree. Without credentials, why should anyone waste their time looking at this design? As far as the Navy is concerned, you're no different than anyone off the street, bringing it some design it didn't ask for. And to the wrong agency,“ he added.

„I know that this isn't SPAWAR's area, sir, but I'm SPAWAR's employee. I didn't want to go outside our own chain of command.“

Gaston nodded, smiling approvingly. „Quite right. Your actions have been correct, although“—he glanced at his data pad—„your supervisor's concerned with the amount of leave you've taken lately.“

„All of this work had been on my own time, sir. I didn't want to do it on Navy time.“

Gaston scowled. „We're on Navy time now.“ He sat silently for a moment, pretending to consider the issue, while Ray fretted.

To be truthful, Gaston had made up his mind before McConnell ever walked in the room. He'd just wanted to interview the engineer himself before letting him go on to Carson.

Defender was too widely known, at least at the lower levels. It was a miracle the media hadn't picked it up already. It was popular, the kind of grassroots concept reporters loved. No matter that it would never be built. If he said no, then he'd be blamed as one of the people who kept it from happening. Better to let McConnell hang himself. Gaston didn't have to support it, just pass it on.

„All right, I'll forward it *without endorsement*.“

Ray had begun to hope.

The meeting with Admiral Carson had begun poorly. The admiral had granted him fifteen minutes between other appointments, and appeared distracted. Ray had started his pitch, but Carson had cut him off after only a few words, chopping with one hand as if to cut off the stream.

„I'm familiar with the design, Mr. McConnell,“ Carson had said with irritation. „I've received three copies in the past two days, besides this one. I'm also familiar with the problem. I've spent most of the last week in Washington, answering questions about our own vulnerability and what SPAWAR could do to counter it.

„I’ve also been fully briefed about Chinese antisatellite threat,“ he said finally. „The current estimation is that the Chinese can’t possibly have many more of the kill vehicles.“

He walked over to where McConnell sat, almost leaning over him. „I’ve also looked over your personnel file. I was looking for your academic credentials. They’re bad enough: No doctorate, a master’s in electrical engineering and an undergraduate degree in physics. What made you think we’d take a spacecraft designed by you seriously?“

Carson picked up a data pad and checked something on the display. „And then I found this: After your master’s degree, you applied for the astronaut program. Correct?“

Ray nodded. „Yes.“

„And were turned down. And then you joined the Air Force. You served six years as a junior officer, and during that time applied three more times to become an astronaut. Also correct?“ His tone was more than hostile.

„Yes sir. Each time I missed by just a few percentage points. I hoped...“

„You hoped to get into space with this half-baked fantasy!“ shouted Carson, pointing to *Defender*. „Did you plan on scoring the theme music for your little adventure, too?“

„Admiral, I’ve always been interested in space, but that doesn’t have anything to do with this. I just want to get this idea to where it will do the most good.“

Carson had sat, glowering, listening while Ray protested.

„Your idea is worthless, Mr. McConnell. At best, it’s a distraction at a very difficult time. At worst, it’s a personal attempt at empire building, but a very crude one.“

„Although you’ve broken no rules I’m aware of, I am directing the Inspector General’s office to review your activities and your work logs to see if any of your fantasizing has been done on government time. If that is the case, docking your pay will be the weakest punishment you will suffer. Now get back to work and hope I never hear about *Defender* again!“

Sitting in his office, Ray struggled with his feelings. He’d created *Defender* because he’d seen the need for it. Why didn’t the chain see that need as well? Was he wrong? Maybe he didn’t know enough to do it. But he’d had lots of help in designing *Defender*. And he’d gotten lots of mail back, some critical, but more supportive, some even offering help.

Was it time to sit down and shut up? He liked his job and the people he worked with. He didn’t want to lose it over *Defender*.

He hadn’t expected the command to be hostile. Indifferent, yes, but once he’d shown them the logic of the design, he’d hoped for some support.

He picked up the phone then, remembering, put it down, and pulled out his personal cell phone. No personal calls on a Navy line. He looked up a number and punched it in.

„Jennifer Oh.“

„Hi, Jenny. It’s Ray McConnell.“ He tried to sound cheerful, but even he could tell it didn’t work.

„Ray, you don’t sound too good. What’s wrong? Problems with *Defender*?“

„Only if I want to keep my job.“ He sighed. „Let’s just say that the Space and Naval Warfare Systems Command won’t be giving me its endorsement. Admiral Carson almost had me thrown in the brig.“

She laughed, half at his joke and also to cheer him up. „You’re joking.“ He could hear the smile in her voice.

„He’s siccing the IG on me, to see if I’ve wasted any Navy time on this quote half-baked fantasy unquote.“

„That’s not good.“ She paused, then asked, „So, you’ve gone all the way up your chain of command with no success?“

„I’d call that an understatement,“ he replied.

„Well, then it’s time to try another chain,“ she said forcefully. „Let me make some calls.“

„What?“ McConnell was horrified. „Jenny! I’m poison. Please, just ditch anything you have with my name on it. *Defender’s* all over the Web. We’ll just have to hope someone picks it up and uses it.“

„No, Ray. We’re not going to just sit. *Defender’s* a good idea, and I’m going to do everything I can for it.“ She paused again, and her tone softened, almost calming. „Let me call some of my friends on the NAVAIR staff. Admiral Schultz is a pilot and an *operator*, not some bureaucrat. I’ve met him, and I think he’ll give you a chance.“

Ray didn’t know what to say except, „Thanks, Jenny. I hope this doesn’t backfire on you.“

„Anything worthwhile is worth a risk, Ray. I’ll call you this evening and tell you what I find out.“

Office of the Chief of Naval Operations, The Pentagon, September 28

„I am not going to go into the Joint Chiefs of Staff and propose that we adopt some crackpot design that came off the Internet!“ Admiral John Kramer was so agitated he was pacing, quickly marching back and forth as he protested.

Admiral William Schultz, Commander in Chief, Naval Aviation, sat quietly in his chair. He’d expected this reaction, and waited for Kramer to calm down a little. Schultz was calm, sure of himself and his mission.

„I’ve checked out this design, John, and the engineer. Both are OK. There are some technical questions, but nothing he’s done here is science fiction. The man who designed it, Ray McConnell, had a lot of help. It may be unofficial—Schultz leaned forward for emphasis—„but it’s good work.“

He sat back, straightening his spine. „It’s also the only decent idea I’ve heard in almost two weeks.“

Kramer and Schultz were both pilots, and had served together several times in their Navy careers, but where Kramer was tall, and almost recruiting-poster handsome, Schultz was only of middle height, and stockier. And his looks would never get him any movie deals. His thinning sandy hair was mussed whenever he put his navy cap on, while he was sure Kramer kept his in place with mousse.

Kramer was a good pilot, but he'd also been the staff type, the „people person“. Or so he thought.

Used to the convoluted, time-consuming methods of the Pentagon, the CNO continued to object. „Even if we did propose it, and even if it was accepted, where would we get the money?“

„Somewhere, John, just like we've done before. The money's there. We just have to decide what's the most important thing to spend it on.“

Schultz continued, mentally assigning himself three Our Fathers and three Hail Marys. „Look, I've heard the Air Force is buying into *Defender* in a big way. They think it can work, and as far as they're concerned, if it's got wings, it belongs to them.“

Kramer looked grim. The Air Force was shameless when they talked about „aerospace power“. He nodded agreement.

„Let them get their hands on any armed spacecraft, and the next thing you know, we'll lose SPAWAR. Remember the time they tried to convince Congress that we should scrap our carriers and buy bombers with our money?“ Kramer frowned, listening.

Schultz pressed his point. „Do we have any viable alternative for stopping the Chinese, sir?“

Kramer shook his head. „The launch site is out of Tomahawk range, and the President has already said that he won't authorize the use of a ballistic missile, even with a conventional warhead. And you'd need lots of missiles. The way that site is hardened, I'm not certain a nuke would do it.“

„Air Force B-2s could reach it,“ Schultz said quietly.

„But they can't be sure they'd get out alive. The defenses are incredibly thick, and they're expecting us to use bombers. And it would take several aircraft to destroy the gun. We might have to commit as many as ten and expect to lose half.“

„This is better, John. Look, McConnell's flying in here tomorrow. You can meet him yourself. I've listened to him, and I'm convinced.“

„Then that's what we'll try to sell,“ Kramer decided.

Three

Indecision.

Office of the Chief of Staff of the Air Force September 30

General Michael Warner was an unusual Chief of Staff. He flew bombers, not fighters. In an Air Force that gave fighter pilots most of the stars, it was a sign of his ability, not only as an officer, but as a politician. Looking more like a banker than a bomber pilot, he had an almost legendary memory, which he used for details: of budgets, people, and events.

Pilots lived and died because of details. They won and lost battles because of them. And the general kept looking for some small detail that his deputy, General Clifton Ames, had missed. The three-star general had put the target analysis together personally.

Ames had nothing but bad news. An overhead image of the Gongga Shan launch site filled the wall screen. „I’ve confirmed there’s no way the Navy can stretch the range of their Tomahawk missiles. They’ve got smaller warheads than our air-launched cruise missiles anyway. And even if we could adapt a ballistic missile with a conventional warhead, they aren’t accurate enough for this target.“

His data pad linked to the screen, Ames indicated various features of the site as he talked. „The Chinese built this installation expecting it to be attacked by cruise missiles. It has heavy SAM and AAA defenses. They’ve mounted radar on elevated towers to give them additional warning time of an attack. They’ve even constructed tall open framework barriers across the approach routes a cruise missile might use.“ He pointed to the large girder structures, easily visible in the photograph.

„The barrel and all vital facilities are hardened, and there’s the matter of the gun itself. Given its three-meter bore, intelligence says the barrel thickness is at least a foot. Damaging that will require precision at a distance—precisely the capability we’re now lacking.“

„To get an eighty percent chance of success would take twelve B-2s, each carrying eight weapons.“ Ames knew he was talking to a bomber pilot, and watched for Warner’s reaction. The chief just nodded glumly, and Ames continued.

„And the worst part is that the Chinese would have the gun back in operation again within a few months, possibly a few weeks. We’re certain the barrel is constructed in sections, like the Iraqi gun. If a section is damaged, you remove it and replace it with a spare section. We’ve even identified in the imagery where they probably keep the spares.

„We estimate follow-up strikes would be needed every two weeks—indefinitely.“

Even as he said it, Ames knew that wasn’t an option. Airpower provided shock and speed, but it had to be followed up by something besides more air strikes.

„What about losses?“ Warner asked.

„Using the standard loss rates,“ Ames replied, „there’s a good chance we’ll lose several bombers in the first few raids. And part of the flight path is over Chinese territory.“ The implications for search and rescue were not good.

„All right, Cliff. Send this on to the Chairman’s office with my respects. And my apologies,“ Warner muttered.

„Sir, I’ve been looking at *Defender*,“ Ames offered. „One of my friends in the ABL Program Office passed it to me with his analysis. I think we should consider it.“

Warner had heard about *Defender*, of course, but hadn’t had time to do more than dismiss it as a distraction. „Are we that desperate?“ the chief asked.

**Gongga Shan Mountain, Xichuan Province, China
September 30**

General Shen Xuesen stood nervously in the launch center. It was hard to maintain the unruffled demeanor his troops needed to see. He needed all of his experience to look calm and relaxed.

Visitors at such a time would make anyone nervous, and worse, distract the launch team. A television crew was unthinkable, but there they were. It was a State-run crew, of course, and they were being carefully supervised, but they brought lights and confusion and, worst of all, exposure.

Now they were filming an actual launch. Beijing had even asked if they could film the intercept, but Shen had refused absolutely, on security grounds. He understood the propaganda value of the Dragon launch, and offered to supply tapes of previous shots. They all looked alike. Who would know?

But the piece needed shots of activity in the launch center, and the reporter would add his narration. At least the general had been able to avoid an interview, again citing security reasons.

INN News September 30

The oval opening erupted in flame, and a dark blur shot upward. Mark Markin's voice accompanied the video. „Released less than two hours ago, this dramatic footage from Gongga Shan Mountain in China shows the launch of a *T'ien Lung*, or Celestial Dragon.“ Markin's voice continued as the scene shifted to a more distant shot. The mountaintop, a rugged texture of browns, was capped by a small white cloud of smoke that lingered in the still morning air.

„That is their name for the spacecraft, or *ASAT vehicle*, as U.S. officials describe the weapon. They also confirmed the destruction of another GPS satellite just a short time ago, the time of loss consistent with the launch shown here.

„This footage was released through Xinhua, the Chinese official news agency. The narrator claimed that China had now demonstrated military superiority over the United States, and that their superiority had halted American aggression in the region.“

The mountaintop and its fading smoke were replaced by a computer-drawn representation of the gun, angled upward inside a transparent mountain.

„Intelligence officials here believe that the gun is based on the work of Dr. Gerald Bull, who designed a smaller weapon for Iraq. That weapon had a barrel of almost a hundred feet and a bore of nearly a meter. It was capable of launching a projectile several hundred kilometers, and although it was fired successfully in tests, it was never put into service. The Chinese would have no problem obtaining this technical knowledge from the Iraqis, probably in exchange for weapons.“

Computer animation showed the process of loading the projectile, the launch, and sabots falling away from the projectile before a rocket booster fired.

„Before he was killed, possibly by foreign agents, Bull wrote of using such guns to launch spacecraft. Sources have hinted that a smaller gun, believed capable of firing across the straits of Taiwan, was built and tested. They now speculate that gun may never have been made fully operational, and have just served as a test bed for this much larger weapon.“

The animation disappeared, replaced with Markin, with an image of a GPS satellite behind him. „This brings to four the number of GPS satellites known to have been destroyed by China. While American officials have wondered publicly about how many *T'ien Lung* vehicles the Chinese can build, China threatened during the broadcast to destroy the entire GPS constellation unless *America abandoned its plans for Pacific hegemony.*”

United Flight 1191, En Route to Washington, D.C. September 30

Ray McConnell turned off the screen and put his head back against the seat. He hated being right, and he knew those „American officials“ were indulging in wishful thinking. China's space program had a good base of design experience. The kill vehicle, the *T'ien Lung*, was not trivial, but it was well within their capabilities. The GPS satellites were unarmored and had only the most limited ability to maneuver. Technically, it wasn't a problem.

And logically, if they'd committed themselves to this premeditated confrontation, would they only have four or five bullets for their gun? *I'd have two dozen stockpiled, and a factory making more,* Ray mused.

It was bad news, although it helped strengthen his case.

He said it again. His case. Schultz had called him from Washington last night, telling him to come out ASAP, on Navy orders.

Sitting in his apartment, still depressed about his meeting with Carson, Schultz's call had struck like lightning. McConnell hadn't known what to think or hope.

He'd called Jenny to thank her, then frantically packed. He'd spent most of the night trying to organize the jumble of material that had supported the *Defender* design effort. McConnell hadn't even phoned work, just sending an e-mail asking for leave.

Ray glanced at his watch, still on California time. By rights, Rudy only got the e-mail at seven, about the same time the plane had taken off. Ray would be on the ground in another few hours, and hopefully by the time the brass heard anything, he'd know one way or the other.

McConnell decided he did feel hopeful, but he couldn't tell whether it was for *Defender* or his own personal success. Ray hadn't even realized that he personally had anything at stake until his meeting with Carson yesterday. He'd thought of *Defender* as just an engineering project. His personal stake in it was greater than he'd realized, but that was all right. Other people, like Jenny, were committed to it as well, and that spurred him on.

He hooked his data pad up to the screen built into the chair back and started opening files. *Defender* still needed a lot of work. He'd seen enough Pentagon briefings to know what was expected. He couldn't make her perfect, but he could at least hit the high points.

„Ladies and gentlemen, this is the pilot. We've just received word that Air Traffic Control has rescheduled our arrival into Dulles to four-fifteen instead of three-ten this afternoon. There's no problem with the weather, but because of the recent

problems with the GPS system, they've just announced they'll be spacing aircraft farther apart near the airports, as a precaution.

„United apologizes for the delay. Passengers with connecting flights...“
McConnell smiled. For once, he was glad for the extra time in the air.

Office of the Chief of Staff of the Air Force, The Pentagon September 30

Captain „Biff“ Barnes tapped his data pad and the file collapsed down into a small spaceship icon. His presentation had condensed McConnell's hundred-page design document down to fifteen minutes. It had been a long fifteen minutes, with Warner, his deputy, General Ames, and a flock of colonels watching intently. They'd all asked a lot of questions. Barnes had been able to answer many of them, especially about the laser installation, but not all. *Defender* was definitely a work in progress.

General Warner opened the discussion. „Captain, you've told General Ames that you think *Defender* will fly.“

Well, thought Barnes, actually I passed the file to Ed Reynolds in the ABL Program Office and Eddie gave it to the general. Also, I only told Eddie that Defender was better than anything else I'd heard of. The next thing I know, I've got two hours to prep a brief for the Chief of Staff of the Air Force.

But Barnes didn't feel like correcting either general. „It's the best shot we have, sir,“ trying to sound positive, „unless there's something in the *black* world.“ The armed forces ran a lot of „black“ programs, secret projects with advanced technology. The F-117 had been one of the most famous. Was there one to deal with this threat?

„Nothing that will help us, I'm afraid.“ The general shook his head, half-musing to himself. „The X-40's operational, but she was never supposed to be more than a test bed. She doesn't have the payload for this in any case.“

Looking at Barnes directly, Warner continued, „Yes, Captain, there is technology in the classified world that would help us—in anywhere from five to twenty years. The Chinese have jumped the gun on us.“ He sounded angry.

„We should own this crisis, and we just don't have the tools to deal with it! And now some SPAWAR employee and his buddies in their free time have come up with this, and we're all taking it seriously?“

Barnes waited for the general to continue. When it appeared he'd run down, the captain said, „Well, sir, at least he's former Air Force.“

Warner laughed, a little grimly, then looked at the wall clock. „All right, then, Captain. Let's go see if the Joint Chiefs have a sense of humor.“

National Military Command Center, The Pentagon September 30

Ray McConnell looked around the fabled War Room. Every available chair was filled, usually by someone in uniform, and often by a uniform with stars on it.

The Joint Chiefs themselves sat on both sides of a long table, with the Chairman at the head on the left. A briefer's podium stood empty at the head, and behind the podium, the entire wall was an active video display. Ray almost felt at home.

He also felt rushed and a little unorganized. His plane had landed just a short time before. The Metro had taken him straight from Dulles to the Pentagon, and Admiral Schultz himself had met Ray. The outgoing admiral had quickly filled him in and shared some of his enthusiasm with the hurried engineer. They'd dropped his bags in the CNO's office, of all places, and made the meeting with only minutes to spare.

Several rows of chairs to one side of the main table were filled with a gaggle of aides, experts, and assorted hangers-on, including Ray. Nervously, he typed on his data pad, working on the design that was never finished.

The Vice Chairman, a Navy admiral, stepped up to the podium, and the buzz in the room quickly died. „Gentlemen, the Chairman.“

Everyone rose, and Ray saw General Kastner, the Chairman of the Joint Chiefs of Staff, enter and take his seat. McConnell wasn't normally awed by rank, but he realized that this collection of stars could really make things happen. They literally were responsible for defending the country, and that's what they'd met to do.

The Vice Chairman, Admiral Blair, tapped the data pad built into the podium. A bullet chart appeared on the screen. It was titled „Protection of Space Assets“.

„Gentlemen, our task today is find a course of action that will protect our satellites from Chinese attack. Any solution we consider“—and he started to tick off items on the list—„must include the cost, the technological risk, the time it would take to implement, and the political repercussions.“ He glanced over at Kastner, who nodded approvingly.

Blair continued. „Above all,“ he said, scanning the entire room, „it must work, and work soon. The material costs alone have been severe, and the potential effects on American security and the economy are incalculable.“

„For purposes of this discussion, while cost should be considered, it is not a limitation. Also, the President considers these attacks by China an attack on American vital interests, although he has not made that decision public.“

Nor will he, Ray thought, until we can do something about them. So cost wasn't a problem, just shut down the Chinese, and do it quickly.

Blair put a new page up on the display, listing some conventional methods of attack. „You've all sent analyses indicating that these are not viable options. Our purpose is to see what other means you've developed since those initial reports.“

Kastner stood up, taking Blair's place at the podium. Blair sat down at his left. The Chairman looked around the room. „To save time, let me ask a few questions. The President has asked me if we can arm a shuttle and use it to defend the satellites.“ His tone was formal, as if he already knew the answer.

Kastner looked at General Warner, who glanced around the table before replying. „The Air Force would recommend against that. Not only would it take too long to prepare, it's too vulnerable during launch. Certainly if they can shoot down a GPS satellite, they can shoot down a shuttle.“

The Chairman nodded, then looked at the Chief of Naval Operations. „Can we use a missile to shoot down the kill vehicle?“

Admiral Kramer answered quickly. „We'd hoped that would work, sir, but we're sure now that we can't. We had two Aegis ships in a position to track the last ASAT shot seven days ago. We've been analyzing the data since.“

„The *T'ien Lung*,“ Kramer pronounced the Chinese name carefully, „is too fast. Our Standard Block IVs can shoot down a ballistic missile, but as hard as a ballistic intercept is, it's easier than this. At least a ballistic missile is a closing target, but the ASAT is outbound. It's a tail chase from the start. Even if we launched at the same moment, the intercept basket is nonexistent.“

„Does the Army concur?“ Kastner looked at the Army's Chief of Staff. The Army also had an active antiballistic-missile system.

„Yes, sir. It has to be from above.“ General Forest didn't look pleased.

Ray realized the general had just told the Chairman that the Army didn't have a role in solving the crisis. Of course, the Commandant of the Marine Corps looked even unhappier. This was one beach his men couldn't hope to storm.

General Kastner announced, „I'm also allowed to tell you that there are no special assets that might be able to destroy the launch site using unconventional methods.“

In other words, Ray thought, *they can't get an agent into the area*. McConnell didn't even want to think about how he'd destroy the launcher. Talk about the Guns of Navarone...

Which meant they were getting desperate. McConnell saw what Kastner was doing, eliminating options one by one. He knew about *Defender*. He had to know. Ray didn't know what to feel. Was this actually going to happen? Fear started to replace hope.

General Warner finally broke the silence. „Sir, the Air Force thinks we can make the *Defender* concept work.“

Admiral Kramer shot a look at Schultz, sitting next to Ray. Then both looked at McConnell, who shrugged helplessly. Warner's aide was loading a file into the display, and Ray saw *Defender's* image appear on the wall. This was becoming a little surreal.

„Captain Barnes from our ABL Program Office has put together a presentation on the design.“ Ray saw a black Air Force captain with astronaut's wings step up to the podium. As he started to describe the spacecraft, McConnell felt irritation, an almost proprietary protectiveness about the ship. His ship. Ray wanted to speak up, to protest that he could describe it better than anyone, but Kramer wasn't saying anything, and Ray could only remain silent.

It seemed to take forever for Barnes to work his way through the different sections: space frame, weapons, sensors, flight control. The final slide was a list of unsolved design issues.

Ray spoke softly to Schultz beside him. „He's got an old copy of the file. I've solved two of those questions and added a new one.“

Schultz nodded, then pulled out his data pad and typed quickly. Kramer, watching the presentation, looked down at his pad, and tapped something, then turned to look at Schultz, nodding.

General Forrest had started to ask about one of the issues when Admiral Kramer spoke up. „Excuse me, General, but that list may be a little old. Mr.

McConnell, the engineer who designed *Defender*, is here, and has solved some of those problems.“

Schultz nudged Ray, and the engineer stood up and moved toward the podium. As he passed Admiral Kramer, the naval officer muttered, „Go get ‘em, Ray.“ The engineer never felt less like getting anyone in his life.

As he approached the podium, Captain Barnes shot him a hard look, seemingly reluctant to leave. Ray said, „Hello,“ conscious of the captain’s sudden obsolescence, and tried to smile pleasantly. Barnes nodded politely, if silently, picked up his notes and data pad, and returned to his chair.

Ray was acutely aware of the many eyes on him. He linked his pad into the screen and transferred the most recent version of the file to the display. He used the moment’s fiddling to gather his wits. He’d given dozens of briefs. This was just a little more impromptu than most. And much more important.

„I’m Ray McConnell, and I designed *Defender* to protect assets in space from ground-based attacks. It uses the Lockheed VentureStar prototype with equipment currently available to detect launches, maneuver to an intercept position, and kill the attacking vehicle. It also has the capability to destroy the launch site from orbit.“

Barnes had said that much, Ray knew, but he’d felt a need to also make that declaration, to say to these men himself what *Defender* was and what it could do.

He opened the file, and rapidly flipped through the large document. McConnell realized that the pilot had done a pretty good job of summarizing *Defender*, so he concentrated instead on the work that had gone into selecting and integrating the different systems. That was his specialty, anyway, and it improved the credibility of his high-tech offspring.

A message appeared on his data pad from Admiral Schultz as he talked. „Are there any Army or Marine systems in the design?“ Ray understood immediately what Schultz was driving at, and spent a little time on the kinetic weapons, adapted from Army antitank rounds. There wasn’t a piece of Marine gear anywhere on the ship, and McConnell mentally kicked himself for not understanding the importance of Pentagon diplomacy.

Ray made it to the last slide as quickly as he could, and felt positive as he assured the assembled generals that all the questions listed there could be answered.

„Thank you, Mr. McConnell.“ Kastner rose again and Ray quickly returned to his seat, barely remembering to grab his data pad. „I’m much more confident about *Defender*’s ability, and probability, than I was at the start of this meeting. It is my intention to recommend to the President that *Defender* be built, and soon.“

McConnell felt a little numb. Schultz gave him a small nudge and smiled.

„We haven’t really discussed the political implications of arming spacecraft.“ General Forest’s tone was carefully neutral, but his expression was hard, almost hostile. Would he fight *Defender*?

Kastner was nodding, though. „A good point, Ted, and part of our task.“ He looked around the table. „Admiral Kramer?“

„I believe the Chinese have solved that issue for us, sir. They’ve fired the first shot, and said so proudly and publicly.“ He smiled. „I think *Defender*’s name was well chosen.“

General Warner added quickly, „I concur. GPS is dual-use. The gaps are already starting to affect civilian applications, and that will only get worse. And those civilian applications are worldwide, not just here in the U.S.“

„All of our public statements will emphasize that we are taking these steps only as a result of Chinese attacks,“ Kastner stated.

Admiral Kramer quickly asked, „Should *Defender* even be made public? With enough warning, the Chinese might be able to take some sort of countermeasure.“

Kastner considered only a moment before answering. „All right, my recommendation will be that *Defender* remain secret until after its first use.“

General Warner announced, „I’ll have my people look for a suitable development site immediately. With all the Air Force bases we’ve closed...“

„Your people aren’t the only ones with runways, General. This is a Navy program. Mr. McConnell is a Navy employee.“

„And that’s why he put his design on the Internet, because of the tremendous Navy support he was receiving.“ Warner fixed his gaze on Kramer, almost challenging him to interrupt. „It was my understanding that he offered this design to the DoD as a private citizen. Certainly the Air Force is the best service to manage an aerospace-warfare design. We’ll welcome Navy participation, of course.“

„The Navy has just as much technological expertise as the Air Force. And more in some of the most critical areas...“

Ray understood what was going on even as it horrified him. *Defender* would mean a new mission, and if it worked, a lot of publicity. That mattered in these lean times, for money, for recruiting, maybe for the future in ways they couldn’t guess. But now they were arguing over the prize like children.

„The Army’s experience with ballistic-missile defense means we should be able to contribute as well.“ General Forest’s tone wasn’t pleading, but his argument almost was.

Kastner spoke forcefully. „We will meet again at 0800 hours tomorrow morning. Every service will prepare a summary of the assets it can contribute, and any justification it might feel for wanting to manage the project.“

Oh, boy, thought McConnell. It’s going to be a long night.

INN Early News, London October 1

Trevor West stood outside Whitehall while morning traffic crept past him. His overcoat and umbrella protected him against a rainy London day, but the wind fought his words. He spoke up, and held the microphone close.

„After an emergency meeting of Parliament this morning, in which the Prime Minister spoke on the Chinese antisatellite attacks, the British government has officially condemned the Chinese and demanded that they stop. The Official Note, which was given to the Chinese ambassador here approximately half an hour ago, protests not only the attacks themselves but the *militarization of space*.

„The Chinese ambassador received the Note without comment.

„The American ambassador, provided with a copy of the Note, welcomed the British support and stated that the United States was doing everything in its power to defend its property.

„Ministry of Defense sources are unsure what the Americans plan to do about the Chinese attacks. They believe a direct attack on the launcher in southern China would be difficult, and the GPS satellites themselves are defenseless.

„One source speculated that the Americans may try to threaten Chinese interests elsewhere in Asia, pressuring them into stopping their attacks. They say they've even seen some signs that this may already be occurring. Of course, military pressure risks a wider conflict—a general war between the United States and China.

„MoD officials refused to speculate what Britain's position would be in such a case.“

Office of the Chief of Staff of the Air Force, The Pentagon, October 1

Biff Barnes sat in a conference room with half a dozen other officers. Printouts and data pads covered the table, mixed with a litter of coffee cups, Chinese food from last night, and doughnut boxes from this morning.

The past twenty-four hours had been a blur to the captain. First the flurry of preparing to brief the Chief of Staff, then the JCS meeting. Barnes considered himself a good pilot, but a minor cog in a much greater machine. Suddenly he'd been asked to do new and challenging things, all at breakneck speed. And those things might change the Air Force. A corner of his mind also asked if this was going to help or hurt his chances for major.

As they had left the meeting yesterday, General Ames had said, „You did a good job on your presentation, Clarence.“

Barnes, already in a foul mood, interrupted. „Please, sir, just *Biff*.“ Why was the general getting on a first-name basis?

Ames smiled. „Fine, Biff. Who knew they would back *Defender* as well? You did fine.“

„Thank you, sir.“ Biff was unsure where this was going, but the back of his neck was starting to tingle.

„I need someone to put that presentation together, Biff. I'll give you as many of the staff as you need, and you can set up in my conference room. We've got until 0800 to come up with the arguments that will sell General Kastner on the Air Force owning *Defender*.“

„Maybe you should get a lawyer,“ Biff suggested. He was half-serious.

„No, I want a pilot, and you're the only one in sight who's been an astronaut.“

By now they'd reached Ames's office, but Biff didn't respond immediately. Finally, the general asked him flatly, „Do you want it?“

Biff knew he could say no if he wanted to. He believed Ames was a fair enough officer not to hold it against him. But Barnes was still mad at the Navy, and McConnell in particular. „Yes, sir. It's in the bag.“ He grinned, a fighter-pilot grin.

Now, the summary was almost ready, deceptively small for all the effort that had gone into it. Barnes was staring at the file's icon, wondering what he'd missed, when General Ames hurried into the room. He'd checked on their progress several times during the night, and Biff started to report when Ames cut him off.

„Turn on the news,“ Ames ordered a lieutenant at the far end of the room. The officer looked for the remote and grabbed it, then fumbled for the power control. „...no response to the Chinese demands yet. The spokesman only repeated demands by U.S. government that the Chinese stop their attacks.“

The INN defense reporter, Mark Markin, stood in front of a sign that read, u.s. DEPARTMENT OF STATE.

„To repeat, the Chinese have now stated what their price is for stopping their attacks on the NAVSTAR GPS satellites. The U.S. must reduce its forces in the region below precrisis levels, especially in Korea and Japan. According to the statement this is *to permanently remove the threat of U.S. aggression against China*. If the U.S. does so, the Chinese promise to cease their attacks. The ambassador also hinted that they might restart the stalled talks on human rights, piracy, and other long-standing disputes.“

Ames said, „That's enough,“ and the lieutenant turned it off.

The general looked at Barnes. „The answer's —*Hell, no*, of course, but you've gotta love the way they're taking it to the media. And some of the reporters aren't helping the situation. *Think about all those poor commuters without their GPS.*“ Ames sounded disgusted.

Biff announced, „We're ready. Let's clean up and go get us a program.“

National Military Command Center, The Pentagon October 1

Ray McConnell had gotten about three hours of jet-lagged sleep last night, and that only because his eyes wouldn't focus on the screen any longer. He'd worked like a fiend, trying to finish *Defender* in one night while the CNO and his staff tried to figure out a way to keep her a Navy project.

He realized he should be on cloud nine right now. Not only was *Defender* going to be built, but the services were fighting over who would run it! Maybe it was fatigue, or the idea of the Air Force taking it away from him, but he wasn't even feeling optimistic.

Schultz had gotten no sleep, and looked it, but they'd all been energized in the morning by the Chinese ultimatum. Anger could substitute for sleep, for a little while anyway.

A group only slightly smaller than yesterday's waited for the Chairman's arrival. He arrived within seconds of eight o'clock, but followed by the Secretary of Defense. Both were hurrying, and the Secretary reached the podium before everyone had even finished standing.

Secretary of Defense Everett Peck was a political appointee, with little experience in the government. The balding, professorial lawyer had served as campaign manager for the President's election two years ago. He'd stayed out of trouble by letting the DoD alone while he dealt with Congress.

He motioned everyone back down, saying, „Seats, please, everyone,“ and then waited for half a moment while General Kastner took his chair.

The Secretary spoke, sounding rushed. „The Chairman and I have just come from a meeting with the President. This follows another meeting last night when General Kastner briefed us on *Defender*.“

He paused, and tried to look sympathetic. „I understand the purpose of this meeting was to choose a service to run the *Defender* program, but that decision has been taken out of the Chairman’s hands.“

What? McConnell looked at the admirals, who looked as puzzled as he felt. In fact, everyone was exchanging glances. Secretary Peck was carefully reading from his data pad.

„The President has decided to create a new service to manage this new military resource. It will be structured similarly to the Special Operations Force, with assets and personnel seconded to it from the other services on an as-needed basis.“

Peck didn’t wait for that to sink in, but continued reading. „This service will be known as the Space Force and will be headed by Admiral Schultz.“ McConnell looked at Admiral Schultz, who looked thunderstruck.

The Secretary looked at Admiral Schultz, who was slowly recovering from the surprise announcement. „Your title would be *Head of U.S. Space Forces*. You would retain your current rank. Do you accept?“

Just like that. Sitting next to Schultz, Ray heard the admiral mutter, „Ho boy,“ then stand. „I accept, sir.“

„Good. Admiral, you will notify your deputy at NAVAIR to take over your duties immediately. You will no longer report to the CNO, but to the Chairman on administrative matters. You will report to me regarding operational matters. You can establish your headquarters wherever you wish, but I assume you will want to be collocated with the construction effort, wherever that is based.“

Kramer, suddenly Schultz’s former boss, still looked confused, as did most of the officers in the room. Kastner was smiling, and didn’t seem like someone who’d had a decision taken out of his hands.

„I won’t congratulate you, Admiral. You’ll come to regret it, I’m sure, but I’m also sure you’ll give it your best effort. And we are desperately in need of that. You have Presidential authority to call on any resources of the Department of Defense to get *Defender* built and stop the Chinese.“

Peck glanced at his pad again, but didn’t read verbatim. „Now for the bad news. Most of you know that the two spare satellites in orbit are also nonfunctional and presumed destroyed.“

Ray’s heart sank. He hadn’t known that, and had assumed the spares were being kept in reserve.

„I will also tell you that although contracts have been let for replacement satellites, the President has decided that none be launched until the threat is contained.“

Reasonable, Ray thought. *No sense giving the Chinese another three-hundred million-dollar target to shoot down. It’ll take a long time for those replacements to be built, though.*

Peck continued. „The Chinese appear to be able to launch one vehicle a week. Given the number of satellites destroyed, at that rate the system will be fifty percent destroyed in seventy days. That is how much time we have to build *Defender*.“

Suddenly, that three hours of sleep seemed like a lot.

Four

Skunk Works.

Andrews Air Force Base, Washington, D.C.

October 1

One of Admiral Schultz's first requisitions had been an Air Force C-20F transport plane. The militarized Gulfstream executive jet was equipped for „special missions“, which meant transporting high-ranking officers and government officials. It was loaded with communications equipment.

As the plane taxied for takeoff, Ray McConnell listened to Admiral Schultz as he argued with the Office of Personnel Management. Technically, as a civil servant, Ray worked for them.

„Of course I understand that you'd want to verify such an unusual order,“ he said calmly, almost pleasantly. „It's now been verified. And I need you to process it immediately. I know you've spoken to your director.“ His voice hardened a little. „I'm sure I won't have to speak to the director as well.“

Schultz smiled, listening. „Certainly. There will be other personnel requests coming through this same channel, possibly quite a few. I'm certain you'll be able to deal with them all as swiftly as this one.“

He turned off the handset and turned to Ray. „Congratulations. Say good-bye to Ray McConnell, SPAWAR engineer, and hello to Ray McConnell, Technical Director, U.S. Space Force.“

Automatically, Ray protested. „I'm not senior enough...“

The admiral cut him off. „You're as senior as you need to be. You're now an SES Step 3, according to OPM.“ Schultz saw Ray's stunned look and smiled. „It's not about the money. You're going to be doing the work of a technical director, and you'll need the horsepower. If there was ever a test of the Peter Principle, this will be it.“

Schultz leaned forward, and spoke softly and intently. „Listen, Ray, you're going to have to grow quickly. I gave you this job not because *Defender* was your idea, but because you had an original idea and put the pieces together to make it happen. Now you're going to have to do a lot more original thinking. You're going to build *Defender*, and set speed records doing it. Don't worry about bureaucratic limitations. Those are man-made. Our only barrier is the laws of physics, and I want you to bend those if you need to.“

Schultz leaned even closer. „I’m also going to give you this to think about. This isn’t just an engineering problem. You’re going to deal with people—a lot of them, and you can’t expect them all to automatically commit to *Defender* the way you have. There’s a transition everyone in charge goes through as they increase in rank, from foot soldier to leader. Foot soldiers only have to know their craft, but leaders have to know their people as well.“

He straightened up in his chair. „End of lecture. We’re due to land in San Diego in five hours. By then, I’ve got to find us a headquarters and a place to build *Defender*. Your first job is to set up your construction team. Use names if you can, or describe the skills you need and let the database find them. After that—“ He paused. „Well, I’ll let you figure out what to do next.“

Ray thought of plenty of things to do next. During the flight, Ray found himself searching thousands of personnel records, balancing the time it took to review the information with the need to fill dozens of billets. Taking a page from Admiral Schultz, he was careful to take people from all the military services, and to look for key phrases like „team player“ as well as professional qualifications. He also included people from NASA, the National Weather Service, and even the FCC.

Then he went outside the government, requesting people from private industry. The government couldn’t order them to participate, but if he had to, he’d hire them out from under their employers.

Remembering the JCS meeting and Captain Barnes, he called up the officer’s service record. Eyes widening slightly, he’d added the pilot to his list. He could find a use for a man with his qualifications.

He added Jenny as well, without looking at her record. Somehow it seemed improper. He knew he needed comm specialists, and that he’d never have to wonder about her commitment to the project.

He also took five minutes to call Jim Naguchi at home. Ray had decided not to include Jim on the list. Although he was a good friend, he was very much involved with his own work, designing a new naval communications system. Naguchi had never shown up for any of the design sessions, either, although he knew all about *Defender*. Ray had been a little disappointed, but not everyone was as crazy as he was.

It was just before seven in California, and McConnell knew the engineer was still getting ready for work. „Naguchi here.“

„Jim, I need you to clean out my office for me, and keep the stuff for a day or two. I’ll send someone around to collect it.“

„What?“ Naguchi sounded surprised and worried at the same time. „I knew Carson was pissed. Did he bar you from the building?“

„No, it’s nothing like that, Jim.“ Ray almost laughed. „I can’t tell you everything, but I’m going to be very busy for a while. Remember *Defender*?“

„Sure.“

„Has Jenny been keeping you briefed?“ Ray asked.

„No, I haven’t seen her for a while,“ he replied. „We only saw each other a few times. I was too laid-back for her. She’s really competitive, Ray. We weren’t good together.“

„She’s been over at the house a few times, with the design group,“ Ray remarked.

„Good for you, Ray. Brains and looks. But watch out. She’s a hard charger.“

Ray grinned. „I will. But get all my stuff from my office, would you please?“

„Sure, if someone doesn’t think I’m ripping you off.“

„No, I sent an e-mail to Rudy. He’ll know. And don’t tell anyone about this.“

„Okay, and later you can explain where you are.“

„I promise.“ McConnell hung up and sat, holding the phone. He had a hundred things to think about, but Jenny kept on moving to the top of the pile. Deal with it, Ray.

He used the phone to send her some flowers, with the message, „You’ve saved *Defender*.“

Miramar Marine Corps Air Station, Near San Diego

October 2

Miramar was a big base, over twenty-three thousand acres of desert north of San Diego. During the Cold War it had been a Naval Air Station, home to the famous „Top Gun“ fighter school. During the defense build-downs of the 1990s the Navy had moved out and the Marine Corps had moved in. They hadn’t needed the whole base, though, and that made it attractive to the new U.S. Space Force.

Miramar had several airstrips, and the newly formed Defense Systems Integration Facility took over the most remote, along with a complex of unused buildings nearby. Authorization for the transfer had come in within an hour of Schultz’s request, and they’d diverted the Gulfstream from their intended destination, North Island Naval Air Station, to land at Miramar.

They’d spent yesterday afternoon, after their arrival, speeding around the base with the commandant, a Marine general, in tow. General Norman had made it clear he’d been told to ask no questions, believe anything Schultz told him, and give them all the help he could.

By the time they’d finished the tour, transport aircraft had already started arriving. Schultz, as part of the security program, had ordered that as much of the supplies and as many people as possible be brought in by air.

General Norman had been more than true to his orders. Squads of Marines had appeared to unload transports. Armed patrols suddenly beefed up the perimeter. Teams of engineers had helped Public Works open and ready the buildings for use. A Marine Corps air-control unit had been flown in to handle the extra traffic, and a field kitchen had turned out their first dinner in their new home.

Besides the Marines, a gaggle of Navy officers had met the plane. During the flight to Miramar, Ray had heard the admiral dickering with his newly pro-moted replacement over how many of his staff could come with him and who had to stay. NAVAIR was located in nearby Coronado, so they’d all been able to get to Miramar in time to meet the plane. They would form the nucleus of the Space Forces administrative staff.

Ray had gone to sleep in a bare barracks room feeling almost optimistic.

October 3

The next morning, their first full day at Space HQ, had taught Ray more about engineering, and people, than he'd thought there was to learn.

Breakfast at 0530 had been a good start, but quickly interrupted. He and Schultz had been planning out the day when a civilian in an expensive suit and tie had hurried into the conference room being used as a mess hall. Escorted by an armed Marine, the middle-aged man had spotted the admiral and almost rushed to the table. Schultz saw him coming and stood.

The civilian had been looking for him. „Admiral Schultz? I'm Hugh Dawson, head of VentureStar Development.“ Dawson was tall, in his mid-fifties, and well built. Ray wondered if he'd played football in college.

Schultz smiled broadly and extended his hand. „Mr. Dawson. Please sit down and join us. We'll be working closely...“

Dawson did not sit down. „I don't know what we'll be working on,“ he replied, a little impatiently. „Yesterday afternoon my security director suddenly calls me in and briefs me into a new secret program. Then I get orders from the head of Lockheed Martin, Mr. Peter Markwith himself, to prepare VentureStar for immediate shipment here. Trash the rest of the test program, never mind the next set of modifications, just trundle her on up here for God knows what.“

Schultz looked concerned, and asked, „Didn't you get the file on *Defender*?“

The executive was still standing. „I spent most of last night reading it. That has to be the worst cover story I've ever seen. Arming VentureStar? In two months? I came up here this morning to find out what's really going on.“

Schultz said calmly, „That's not a cover story.“

Dawson sat down.

The admiral motioned to one of the mess cooks. „Bring Mr. Dawson some coffee.“ He sat down facing the civilian. „I'd like you to meet Mr. Ray McConnell, Technical Director for the project, and for the U.S. Space Forces. He designed *Defender*.“

Dawson automatically took McConnell's hand, but was still reacting to Schultz's words. „There's a U.S. Space Force?“

Schultz smiled proudly. „As of yesterday morning there was, and you and VentureStar are going to be a big part of it. Did you start the preparations to move her?“

Dawson nodded, replying automatically. „Yes, we've started. You don't argue with Peter Markwith. They're finishing up some work on the flight-control systems, but that will be done by the time the carrier plane arrives. Figure two days to make her safe and preflight the carrier, and a day to mate the two.“ He paused, suddenly.

„Markwith said you paid four billion for the VentureStar program. The whole thing. All of a sudden, we're a DoD program.“

Ray looked over at Schultz, waiting for him to respond, but the admiral said nothing. In fact, he was looking sideways at McConnell. All right, then.

„Mr. Dawson, the design is sound,“ Ray ventured. „The Joint Chiefs, even the President have signed off on this. I know it can work.“

Dawson sat, impassive. He wasn't convinced.

Damn it. McConnell realized he knew nothing about this man. *What does he care about? There has to be one thing.*

He tried again. „The Chinese are shooting down our GPS satellites, Mr. Dawson. VentureStar can stop that. She’s the only platform with the space and payload to carry all the equipment we need. In seventy days we’ll have her flying, doing things nobody ever imagined her able to do, and you’ll be the one making the changes. She’ll still be your project.“

Dawson responded, „But the time! We can’t possibly do it.“

„We can if we decide we can, Hugh.“ McConnell was getting motivated himself. „No papers, no bureaucracy, no congressional briefings. Just results.“

„Some of that paper is necessary,“ Dawson reminded him. „They laid out the P-51 on the floor of a barn, but that doesn’t work anymore.“

„We’ll keep some, of course, but how much of that paper is needed to do the work? A lot just fills the government in on how you’re doing, or tells the boss what he needs to know. A lot of it takes the place of good supervision. I’m not here to document a failure.“

Ray pressed his point. „The rules will be different here. We’re going to keep this group small. And I’m the government, as far as *Defender* goes. You won’t have to write a memo to me because I’ll be there on the floor with you.“

Dawson sat, considering for a moment. „Marilyn’s going to think I’ve taken up with another woman,“ he observed, smiling. „What about security?“ Dawson asked. „Our PR people will want to know...“

Ray smiled. One down.

By late afternoon, enough people had arrived and been settled in so that they could start preparations to receive the vehicle. Or rather, preparing to prepare.

One of the hangars was big enough, but only with extensive modifications. A launchpad would have to be built next to it. A new computer hub, independent from the net, needed to be established, and some of the buildings were so old they weren’t even wired for a network. They had to decide where to put launch control. Housing needed to be expanded. And the galley arrangements. And what about recreation?

Ray’s to do list made him wish for a larger data pad. He had one idea and ran it past Schultz. „I love it,“ the admiral said. „I’ll have one of my staff get right on it.“

At Ray’s suggestion, the evening meal was held outside. Even in the fall, San Diego’s weather was excellent, and the Marine Corps cooks fixed an impromptu barbecue.

It was an important occasion. Almost everyone was a stranger to each other, and combined with the uncertainty of the times and the mission, he’d felt the stress level ramp up all day. McConnell realized he needed to get these people together, make them one team, with one mission. Schultz had approved of this idea as well.

Ray waited just long enough for everyone to be served. It was nothing special, just burgers and fried potatoes and greens and soft drinks. Ray was too nervous to eat himself. He’d tried to eat something, at Schultz’s urging, but the first two bites started circling each other in his stomach, like angry roosters squaring off.

The time had finally come, though, and Ray had climbed up on an improvised stage. The portable amplifier gave its customary squeal as he adjusted the volume, and suddenly everyone's eyes were on him.

„Welcome to Space Force HQ.“ He paused for a moment, and heard a few snickers, mostly from the civilians. He smiled broadly, so he could be seen in the back, „I like the sound of it. The good news is, you are all founding members of America's newest and most modern military service.“

He made the smile go away. „The bad news is, we're at war. The Chinese are killing our satellites, denying us the use of space, for both military and civilian use. *Defender* is going to regain control of space for us, for our use.

„You all understand the danger we face. They aren't on our shores, or bombing our cities, but they are overhead. And we know about the high ground.

„I'm expecting each of you, once you're settled, to take your job and run with it. More than that, though, if you see something that needs doing, don't wait for someone else to notice.

„There are going to be a lot more people coming in over the next few weeks. By the time the last of them arrives, you'll be the old hands, and I want you to tell them what I'm telling you now.

„You'll also wish we were twice as many. It's not for lack of resources. We've got a blank check from the President himself for anything or anyone we need. You're here because you're some of the best. I could have asked for more, but I didn't. A small organization thinks fast and can change fast.

„Some of you may think that this is an impossible task, or that even if it's possible, we don't have enough time to do it. It's just a matter of adjusting your thinking. The question to ask is not, 'Can this be done in time?' but 'What needs to be done to finish it in time?'"

Ray got down quickly, to gratifying applause. Schultz nodded approvingly, and Ray noticed someone standing next to him, still holding an overnight bag. Suddenly recognizing him as Barnes, Ray hurried over.

The captain took his hand, and was complimentary, although he didn't smile. „Good speech.“ He motioned to the crowd of perhaps fifty, eating and talking. „Did they buy it?"

Ray pointed out a small group of men and women. They sat around a circular table, talking as they ate. Their attention was on a sheet of paper in the center. One would point, or draw, and then someone else would take a turn.

„They'll never stop working on it," McConnell replied. „We should probably have a curfew so that we'll know they're getting enough sleep.“

„So what do you have for me?" Barnes asked.

„We need someone to survey all the „black“ DoD programs to see if there's any technology that we can use.“ Ray said it simply, like he wanted a list of names out of the phone book.

Barnes felt like telling him he was crazy, but only for a second. The Department of Defense ran dozens, possibly scores of „black“ programs, not only classified, but also „compartmented“. In other words, you didn't even know they existed unless you needed to know they existed. Each had its own security program, and it

normally took a week or longer to get „briefed“ into a program. Biff didn't think he had that much time.

McConnell was watching him closely. Was this some sort of test? He didn't think they had time to waste on such things. How to do it quickly?

„We'll have to go through the head of DoD security,“ Barnes suggested. „He's the only one who can grant me blanket access, and tell everyone to honor it.“

„I'll call him tomorrow morning,“ said Schultz. „You'll have that clearance by lunchtime, along with Ray and me.“

„We'll need a secure facility,“ Barnes added. High-security information was supposed to be kept in special rooms, electronically shielded, with carefully controlled access.

„We'll get you a shielded laptop tomorrow as well. That will be our secure facility until Public Works gets a real one set up.“

Coronado Hotel, San Diego, California October 4

The outside line rang, and Geoffrey picked up the phone. „Good morning, Coronado Hotel Concierge Desk. Geoffrey Lewis speaking.“

„Mr. Lewis? This is Captain Munson, U.S. Navy. I'm sorry to call you at work, but we couldn't reach you before you left your home.“

„The Navy?“ Geoffrey was a little confused. He'd served in the Navy ten years ago, as a storekeeper. That was before he'd gotten his hotel management degree, before he started work here.

„I'll be brief, Mr. Lewis. I need someone to take care of a large group of people. They're very busy. You and a small staff will see to their needs while they work on other matters.“

„Captain Munson, I'm not sure I understand. I'm quite happy...“

Munson named a figure over twice what Geoffrey made as a junior concierge. Lewis wasn't sure the senior concierge made that much.

„The job will last at least three months. You'll work hard for that money, and you'll have to live on site.“

„And where is that site, exactly?“ Geoffrey asked. The mystery of it was intriguing.

„Not too far,“ answered Munson carefully. „Your quarters will be quite comfortable. What's your decision?“

„Just like that?“

„Just like that,“ replied Munson. „We're a little pressed for time.“

„The money's good,“ Lewis admitted. „But you don't know enough about me.“

„We know quite a bit about you, Mr. Lewis. Please, if you don't want the job, I have other calls to make.“

Geoffrey looked at the first thing on his list. Theater tickets for a couple from Kansas. Whoopie.

Space Forces Headquarters

October 5

Ray woke up thinking about housing. He'd gone to bed worrying about it, and was still thinking about it this morning. He was supposed to be building *Defender*, and instead he had to find places for people to live. But the first contingent of the Lockheed Skunk Works people would arrive from Palmdale this afternoon.

He hurried from the barracks past the office complex to the mess hall. None of the buildings he passed had originally served that purpose, but those were their present functions. The compound was already bustling, with people hurrying about on different errands. He could hear the sound of power tools from inside one empty building.

Coffee and a bagel were all he usually had for breakfast, and he could have had that at his desk, but people were already expecting him to put in an appearance in the morning, to be available. It was a tradition he'd decided to encourage.

He was taking his first bite when Biff Barnes walked in the door. Ray still felt uneasy about Barnes, guilty about embarrassing him at the JCS meeting. Was that why he'd picked him to work on *Defender*? But his qualifications made him a natural.

Barnes walked over to the table, and Ray motioned for the officer to join him. Ray's eyes were automatically drawn to Biff's astronaut wings.

„When were you in the astronaut program?“ Ray asked. He tried not to sound like some autograph seeker.

„From '05 to '08,“ Barnes replied casually. „I flew one mission, then missed another because of mission change. I'd only missed one tour with the regular Air Force, so I decided to get back to real flying.“ His voice hardened a little. „And now this. I was supposed to get major and an Ops Officer billet after my tour in the program office. God knows what's happened to that.“

Ray hadn't expected to hear that Barnes had voluntarily left the astronaut program. McConnell had worked as hard as he could for as long as he could remember to become an astronaut. And Barnes had walked away from it?

Almost without thinking, McConnell asked, „It wasn't medical?“ His tone was incredulous.

„No,“ replied Barnes with a little irritation. „People do leave the program voluntarily. Proficiency time on T-38s is not the same as helping run a squadron or flying a fighter.“

It was clear Barnes didn't think of his time as an astronaut fondly. And he was not happy with his assignment here. He liked to fly.

Ray offered, „I'm sorry I disrupted your tour, but I need pilots to help build *Defender*. In addition to all your other skills, you're a reality check on what's going on around here.“

Barnes smiled, the first time Ray had seen the pilot pleased. „I think you'll need a bigger dose of reality than I can provide.“

McConnell automatically smiled back. „Look, I'm sorry I upstaged you at that meeting. We had no idea the Air Force was going to back *Defender*.“

„Yeah. I was the guy who suggested it to the brass.“ Biff looked like he was regretting the idea.

„And thanks for that support. I'm sorry I can't promise to make it up to you.“

„Stop apologizing,“ Biff ordered. „I’m here, and I’ll help you build her.“

Ray nodded silently. It wasn’t a ringing commitment, but he felt the air was clear.

Biff looked around, making sure there were no eavesdroppers, then turned on his data pad and passed it to McConnell. „Here’s the review of those classified programs you asked for. It took me most of the night, but it was so interesting I didn’t want to stop.“

McConnell took the pad, handling it carefully. As he studied the long list, his eyes widened. „I had no idea...“

„Neither did I. After this is all over, we’ll both have to burn our brains. The point is, there are some programs here that we might be able to use. I need a secure facility to work in, to store stuff.“

Ray grimaced. „The engineers are working on beefing up the handling crane. Without that, we can’t lift the VentureStar off her carrier. And after that they have to start work on the pad.“

„Can we get more engineers?“

McConnell shook his head. „Not quickly. We’re already using all the ones available on the West Coast. We’ll have more in a week.“ He paused, considering. „Where are the programs you’re interested in located?“

Biff saw where he was going. „They’re spread all over the map, but they all have offices in D.C.“ He paused. „I leave right away, right?“

„You can take the C-20,“ Ray told him. „Hell, you can *fly* the C-20. We’ll have something with metal walls set up by the time you get back.“

Barnes face suddenly brightened. „Ray, the C-20 has metal walls.“

McConnell smiled, nodding. „We’ll need to post a guard, but Marines like guarding things. It lets them carry guns. Go get it set up.“

Biff nodded and left quickly, almost running. Someone else was waiting.

Space Forces Headquarters October 5, 0430

They’d scheduled the arrival carefully. You couldn’t count on overcast, especially in the California desert, so they’d chosen a satellite-free window after dark.

They all got up early to see it. Ray, standing by the end of the runway with a cup of coffee, saw them start to stream out of the buildings, walking slowly over to the tarmac. The handling crews were ready, and General Norman had arranged for a „nighttime base security exercise“ that filled the area with patrols. The base fire department had also sent their equipment. Ray approved, but the thought made a small knot in his stomach.

Ray waited, impatient. They’d heard nothing, so everything should be fine. But nothing would be fine, not until it was all over.

Admiral Schultz walked up with a civilian in tow. „Ray, meet Mr. Geoffrey Lewis, our new morale officer.“ Seeing McConnell’s distracted look, he reminded Ray, „Your idea? The concierge?“

Suddenly remembering, Ray shook the man's outstretched hand. „Welcome to the Space Force, Mr. Lewis.“ Lewis was a sandy-haired man, in his mid-thirties. Large glasses on his round face made his head seem large for the rest of his spare frame. While most of the civilians wore jeans and polo shirts, Lewis was dressed in khakis and a sport coat.

„Thank you, Mr. McConnell. The admiral's explained what you want done. I'm to take care of the people here. Run their errands, reduce their distractions. I've never had to sign a security form to be a concierge before.“

McConnell grinned. „And you've never had Army quartermasters as your staff. But these people have all had their lives and jobs interrupted to work here. Do as much as you can to take care of their personal needs.“

Lewis smiled. „I've already got a few ideas.“

„Here she comes,“ said Schultz softly.

Ray turned as Schultz spoke, his attention drawn by the plane's landing lights as they came alive. The 747's white underside reflected the lights, but everything above the wing was in shadow.

Instinctively, Ray stepped back, awed by the size of the four-engined monster. It looked a lot bigger from the ground than it did from an airport jetway. The noise of the jet engines also grew until it was almost unbearable.

Ray began to fear that some terrible mistake had been made, that the jet had come in alone, but as it descended, the light finally caught the broad white wedge on top of the 747's fuselage.

The VentureStar was just half the length of the jumbo jet, and as wide as it was long. A smooth, blended shape, two short wings jutted out from the back, angling up and back. He knew it was huge, but it looked so fragile perched on top of the big jet.

He was suddenly afraid, and his insides tightened as he watched the plane come down and touch the runway. The engines crescendoed and the noise washed over him as the pilot cut in the thrust reversers. He could smell jet exhaust and burnt rubber as the plane's wake shook his clothing. He didn't relax until the plane came to a stop, then turned to taxi over to the hangar.

VentureStar was the prototype for a fleet of commercial single-stage-to-orbit space vehicles. In development since the early 1990s, an experimental small-scale version, the X-33, had successfully completed testing just after the turn of the century.

Like the space shuttle, VentureStar carried its payload in a big cargo bay, fifteen feet wide by fifty feet long. It used the same fuel, as well, liquid hydrogen and liquid oxygen. But the shuttle took months to prepare for a launch, and used expendable boosters that had to be reconditioned after each launch. VentureStar launched using her own aerospike engines, and landed conventionally like the shuttle. She could take fifty tons to low-earth orbit after two weeks' preparation.

The engineers were already preparing to lift VentureStar off the carrier aircraft. They had barely enough time before the satellite window closed. Teams also stood by to unload the 747, which carried instruments and spare parts. Some of them had strange looks on their faces, and Ray made a note on his pad to check with the security director. There was...

„Thanks for the flowers, Ray.“ A voice startled him, breaking his concentration. He turned to see Jenny smiling at him. She explained, „I came out to watch the landing and saw you over here.“

„You're welcome,“ he replied automatically. Gathering his wits, he asked, „Are you okay with your job?“

„Setting up communications for an entire space program?“ She laughed. „I could have waited ten years for that big a job, if I ever got it at all.“ She knew what he wanted to ask, and told him before he could. „I can do it. I've had to expand my consciousness a little, but I'll get it done.“

She looked up at the huge spacecraft, perched on the even larger carrier plane. „This makes it real, doesn't it?“ Her tone was half pride, half pleasure.

Ray caught himself about to say something stupid, about to brag about it all being his idea. But it only took one man to have an idea. It had taken a lot more to get it going, and would take that many more to bring it to life.

„It's starting to be real, Jenny.“ He wanted to stay, and talk, and he could see she would if he wanted to, but that wasn't why they were there.

Wishing each other good luck, they went to work.

Space Force Headquarters

October 7

His phone rang while Ray was inspecting the hangar. He'd been waiting all day. It was Schultz's voice, sounding resigned. „They've done it again. Check your pad.“

McConnell activated his data pad. „...have confirmed the latest Chinese claim, made less than fifteen minutes ago. Another *American targeting satellite* has been destroyed, and the Chinese renewed their promise to do the same to every American satellite unless they *acknowledge Asian territorial rights*.“

The correspondent's face was replaced by a press conference, while his voice added, „In response to growing pressure to act, U.S. defense officials today announced a new program.“

Ray's heart sank to the floor. Has some fool decided to take them public? Automatically, he started walking, while still watching the pad.

The official at the podium spoke. „To deal with this new threat to American commerce and security, an Aerospace Defense Organization has been established under the direct command of General David Warner, Chief of Staff of the Air Force. The other services will also take part. Its mission will be to defend American space assets against any aggression. Here is General Warner, who will take a few questions.“

By now Ray was walking quickly, still watching the pad. He made it to Schultz's office just as the general was assuring the press that he had no intention of taking over NASA.

Ray's data pad was echoed by Schultz's wall screen. The admiral saw Ray and waved him in, with one eye on the screen. The rest of the admiral's attention was on the phone. „I appreciate the need for security, Mr. Secretary, but the effects on staff morale should have been considered. A little warning would have let us brief

them. And I must have your assurance this will not affect our resources. Thank you. I'll call tonight, as always, sir. Good day."

Schultz hung up, almost breaking the little handset as he slammed it into its cradle. „Peck assures me this new organization is a blind, designed to distract attention away from us.“

„And get rid of some of the heat DoD's been taking,“ Ray added.

„For about one week, I'll bet,“ Schultz agreed. „As soon as the Chinese shoot down another satellite, they'll be all over the general, asking him why he hasn't done something.“

„And what about resources?“ Ray asked, concerned.

„Well, he's going to need people, and money, and I have a hunch Warner's going to take his charge seriously. I'd have to agree with him, too. I'm a belt-and-suspenders kind of a guy. So he might get people or gear we need.“

Ray suggested, „Well, can we draw on his program? Use it as a resource?“

Schultz sharply disagreed. „No way. We don't want any links with them. Any contacts might get traced back. And if we start poaching, we'll make enemies. We have the highest possible priority, but we can't throw our weight around. There are people in every branch of the government who would love to see us fail, if they knew we existed.“

Ray sighed. „I'll put a notice on the local net, and I'll speak personally to every department head, especially Security.“

Schultz's attention was drawn to the wall display. A new piece, labeled REACTION, was on. A congressman was speaking on the Capitol steps to a cluster of reporters. Schultz turned up the volume. „...done the math, this new Aerospace Defense Organization will have to act quickly or we'll have nothing left to defend.“

Space Force Headquarters October 13

Barnes knocked on McConnell's open door, then stepped in almost without pausing. Everything was done quickly, Barnes thought, with the formalities honored, but only barely.

McConnell, in the middle of a phone call, waved him into a folding chair, the only other seat in the office, then said into the phone, „I'll call you back.“ He hung up and turned to face Barnes.

Expecting to be questioned about the technology survey, Barnes started to offer his data pad to McConnell, but Ray waved it back.

„You're close to done, aren't you?“

„Yes,“ agreed Biff. „We've already started to receive some material. But there's a lot of follow-up to be done.“

„That's old business, Biff. I need you to turn it over to someone else as soon as you can.“ McConnell paused, but kept looking at him. „We need you to be mission commander for the flight.“

Biff didn't say anything. He absorbed the information slowly. Although he'd wondered in his few spare moments who would get to fly the mission, he'd assumed NASA would supply rated astronauts.

Did he want the job? Well, hell yes. Biff suddenly realized how much he wanted to fly in space again, and on what would be a combat mission. He knew he could do it. He was a fighter pilot, after all.

McConnell pressed a key on his data pad. „Here’s a list of the prospective flight-crew candidates.“ Biff heard his pad chirp and saw the file appear. He opened it and scanned the list as Ray explained.

„Most are already here, a few are not, but all met the criteria Admiral Schultz and I came up with. You’ll need six: A mission commander, a pilot, a copilot and navigator, a weapons officer, a sensor officer, and an engineer. We listed all our requirements. If you disagree with any...”

„Your name isn’t here,“ Biff interrupted.

„What? Of course not. It’s not the whole team, just the...”

„No,“ Barnes insisted. „You’re flight crew. You should be the engineer. You’re putting her together. You know her best.“

McConnell was as surprised as Barnes had been. „What?”

„Articulate answer, Ray.“ Barnes grinned. „Look at it this way. It’s the ultimate vote of confidence. You build it, you fly it.“

McConnell couldn’t say no. „This only fulfills one of my lifelong ambitions,“ he answered, a little lightheaded.

„One of mine, too. I get to boss you around.“

Five

Exposure.

INN News October 26

Mark Markin’s backdrop for his scoop was an artist’s animation of the Chinese ASAT weapon, the Dragon Gun as it had been dubbed in the Western press. The artist had added a hundred-foot-long tongue of flame emerging from the barrel as a projectile left the muzzle. Markin didn’t know if it was accurate, but it looked dramatic.

„With the crisis now into its second month, and seven GPS satellites destroyed, continued inaction by the United States has been taken as proof of their helplessness. Their refusal to act to protect these vital assets has been puzzling.

„But the situation may not be as it seems. Presuming that the administration would not stand idle, I was able to find hints that they may be acting after all. Residents surrounding the Miramar air base east of San Diego have reported heavy traffic at the front gate and cargo aircraft arriving at all hours.“

The image shifted to a picture of Miramar’s front gate. „On a visit to the base yesterday, we noticed increased security, and we were not allowed to take photographs on the base. There are also portions of the base we were not allowed

to visit at all. All these provisions were blamed on an increased terrorist threat, but the Marine spokesman could not tell me the source of that threat.

„There have also been stories of hurried requests at defense contractors for personnel and equipment, but these could not be verified.

„All this could be attributed to activities of the Air Force's new Aerospace Defense Organization, but why at a U.S. Marine base? And why did this activity start weeks before the ADO was announced?“

Gongga Shan Mountain

October 28

The smoke was still swirling out of the muzzle when they left the command bunker. The group was small, just the general, Secretary Pan, and their aides.

Pan Yunfeng was First Party Secretary, and General Shen continually reminded himself of that as he answered the same questions he'd answered dozens of times now.

It was impossible to speed up the firing rate. The ablative lining inside the barrel had to be replaced after each launch. In tests, two-thirds of the projectiles had been damaged when the lining was reused, and there had been one near burn-through. Better lining would be more durable, but required exotic materials that were unavailable in sufficient quantity.

No, more men would not get the tubes relined more quickly. Although a kilometer long, it was just three meters in diameter, so only a limited number of men could work inside. All the old lining had to be removed, then each section of new lining had to be anchored and tested before the next section could be added.

Unlike many of China's leaders, Pan was relatively young, in his late fifties. His hair was black, and there was an energy about him that was missing from some of the other men Shen had dealt with. His impatience personified the feeling of the entire Chinese leadership. Why was it taking so long?

Now Pan stood on the side of the mountain, nudging one of the used liners with the toe. The ten-meter section was one quarter of a circle, and several inches thick. The outside was smooth, marked with attachment points and dimples, which Shen explained allowed for some flexing as the projectile passed.

The inside curve of the liner told the real story. The concave metal surface showed hints of the former mirror polish, but the heat and gun gases had pitted the lining, some of the pits deep enough to fit a fingertip. The different layers that made up the lining were visible, a mix of metal and ceramic and advanced fibers.

„Dr. Bull came up with this solution,“ Shen had explained. „The best steel in the world can't withstand the forces inside that barrel when it fires. Instead we just replace the liner after each launch.“

„Which takes a week,“ the Secretary remarked with a sour face.

„It's not wasted, First Secretary. We use the time to upgrade the control system, test the breech, even improve the anti-aircraft defenses.“ He pointed to a nearby hilltop, a new excavation on the side holding a massive billboard radar antenna.

„That radar is part of a new bistatic system designed to detect stealthy aircraft. We've also increased the depth of the anti-aircraft belt and added more standing fighter patrols.“

Later, in the general's office, Pan had questioned Shen even more, looking for ways of shaving a few days, even a few hours, off the interval between launches.

„We're concerned about the time it's taking, General. In any campaign of several months, we have to assume the enemy will take some action to counter our plans.“

Shen listened respectfully. „I've seen the intelligence reports. I'm expecting, of course, that the Americans will do something eventually, but by then we will have won the first battle. And in a few months, we will have our advanced version of the *T'ien Lung* ready. And when you approve the construction of the second launcher, we will be even less vulnerable.“

„But what measures have you taken in the meantime?“

„You know about the Long March booster modifications. You know our intelligence services are blanketing America and her allies.“

Shen tried to reassure the official. „All we have to do is deny them the use of space. It's easier to shoot spacecraft down than it is to put them up. Have the Americans tried to replace any of the lost satellites? Have they launched any satellites at all since we started our campaign?“

The Secretary didn't answer, but Shen knew they both saw the same data.

Shen wanted to make his point, but was careful to keep his tone neutral. It didn't pay to argue Party officials into a corner. „The Americans have no choice. They'll either lose their valuable satellites, or publicly acknowledge our rights in the Pacific region. I think they'll wait until the last minute, refusing to accept the inevitable for as long as possible. When they do see they're backed into a corner, they'll give in. Either way, America is weaker, and we are the new champion of the countries opposing imperialism.“

Space Force Headquarters, Miramar November 5

They all looked at the wall display in Schultz's office. It showed a spiderweb of lines linking boxes. One box at the left was labeled „Begin Construction“, and a dozen lines angled out of it. All the lines eventually led to a single box at the end that said „Launch“. A dotted line with that day's date ran vertically across the diagram. Colors indicated the status of a task, ranging from deep red to grass green. Over half the chart was red, and a lot of the red was on the wrong side of the line.

Ray McConnell had called the meeting, officially to „brief“ Schultz, unofficially to ask him to make a decision Ray couldn't.

„We've made tremendous progress.“ Ray hated the words as soon as he'd said them. *Trite, Ray. Be specific.* Using his data pad, he started to highlight boxes on the chart.

„The kinetic weapon rack will be installed this week, and the mounts for the laser are being installed right now. Sensor integration is time-consuming, but we've got good people on it.“

He came to one box, labeled FABRICATE LASER PROPELLANT TANKS. „It's the one thing we couldn't plan for. Palmdale only had two fabrication units, and one has gone down. The parts to fix it will take two weeks to obtain and install.“

McConnell nodded in the direction of Hugh Dawson, who had become a de facto department head at Space Forces HQ. „Lockheed Martin has moved heaven and earth, but we've only got one fabricator and two tanks to make. This is what happens to the plan.“

He tapped the data pad and the boxes on the wall shifted. Lines stretched. One line, darker and thicker than the others, the critical path, changed to run through the Propellant box.

„At least the heat's off the software,“ someone muttered.

The new schedule added three weeks to the construction schedule. Luckily, Ray didn't have to say anything, because he couldn't think of anything to say. They'd struggled to cut corners, blown through bureaucratic roadblocks, invented new procedures. They'd carried positive attitudes around like armor against the difficulty of their task. Suddenly, he didn't feel very positive.

Schultz stared at the diagram, then used his own data pad to select the Propellant Tank task. It opened up, filling the screen with tables of data and a three-dimensional rendering of the two tanks in the cargo bay of *Defender*.

Defender's laser needed fuel to fire, hypergolic chemicals stored as liquids and mixed to „pump“ the weapon. The ABL-1 aircraft carried fuel for fifty shots, an extended battle. *Defender* would carry thirty, enough for three or four engagements.

While the laser and its mirror could be taken out of its 747 carrier aircraft and used almost as it was, the laser's fuel tanks had been built into the aircraft's structure. They were also the wrong size and shape for the bay. New ones had to be made.

Schultz grunted and selected the 3-D diagram. It was replaced by a schematic of the cylindrical tank, not as neat and showing signs of being hurriedly drawn. The date on the drawing showed it was a month old. The multilayered tanks were built up in sections, then the end caps were attached.

„Reduce the number of sections in each tank,“ remarked the admiral. „That reduces the number of welds to be made.“

„We can't make the sections larger,“ answered Dawson. „They come prefabricated from the subcontractor, and they're limited by the size of the jig.“

„Then we reduce the number of shots,“ Schultz replied. „What if we cut the number of shots in half, six sections per tank instead of three?“

Ray heard an inrush of breath in the room. The laser was *Defender's* main battery. Halving its firepower was a drastic step.

Schultz said, „Better any laser on time than a laser too late. We can replace the small tanks with larger as soon as they've been built.“

McConnell nodded and started working. He ticked off points as he worked. „We'll save weight by carrying less laser fuel, but we'll need more structure surrounding the tanks. It's less weight overall, but it throws off all the center-of-

gravity calculations.“ He paused. „And we only get enough ammunition for two engagements.“

While Ray worked on the design, he saw Dawson recalculating the fabrication times. The executive finished first, and Ray watched him send the figures to the main display.

The chart shifted again, shrinking, but not enough. They were still a week late.

Ray spoke up this time. „We need more time. If we can't raise the dam, let's lower the water. Launch another satellite. That gets us a week.“ That was the decision he couldn't make. Would Admiral Schultz?

„At \$300 million a bird, that's a pretty expensive week,“ Biff Barnes remarked.

Schultz nodded, agreeing with Barnes. „There are political costs as well. The public won't know why. Even the people launching the satellite won't know they're buying time for us.“

Ray persisted. „There aren't any more corners to cut.“

The admiral sat silently for a minute. Ray prayed for everyone to be silent. Schultz knew the situation as well as anyone in the room. He didn't look pleased, but it wasn't a pleasant situation.

„This is where I start earning my pay, I guess,“ Schultz announced. „All right. I'll pass this up the line.“ He looked over the assembled group. „And I'll make it happen. But you should all understand the political capital that will be spent here. We can't do this twice.

„You've got another week. Don't waste it.“

INN News November 11

„The addition of a name, one word, has caused the security dam around *Defender* to burst.“

Holly Moore, INN's White House correspondent, reported this piece, rather than Markin, since it covered the political implications more than the military ones. She stood on the wind-whipped U.S. Capitol steps. The image lasted only seconds, though, before being replaced by the cover of the *Defender* design document.

„INN has obtained a copy of this detailed design for an armed spacecraft designed to attack targets in space and on the ground. According to our source, it was widely distributed in classified defense circles.

„Based on the civilian VentureStar spacecraft, soon to be entering commercial service, the design equips it with radar and laser sensors, guided ground-attack weapons, and a laser from the Air Force's Airborne Laser program.

„No one in the Defense Department would comment on the document, and everyone referred us to the Aerospace Defense Organization. We also tried to contact Mr. Ray McConnell, listed on the cover as the designer, but attempts to locate him have failed. There is another list of names on the inside, all described as contributors to the document. The few INN have located have either denied knowledge of *Defender* or refused to comment.

„Sources have linked *Defender* with the mysterious activity at Miramar. Since the initial reports about this Marine air base, security has been tightened to

extraordinary lengths, with a recent notice banning all flights within ten miles of the base.

„Opposition to *Defender* has appeared just since reports of its existence were aired earlier today. Some are opposed to the militarization of space. Others don't believe the spaceship can be built in time to do any good, and are asking for an accounting of the cost. Links to websites opposing *Defender*, as well as the original document, are available on our website.

„Tom Rutledge, Democratic Senator from Kentucky, spoke on the Capitol steps moments ago.“

The image changed to show a tall, photogenic man with a cloud of salt-and-pepper hair fluttering in the fall wind. „As a member of the Senate Armed Services Committee, I intend to find out why we were not consulted on this wasteful and extremely risky project. The investigation will also deal with the administration's continued inability to cope with this crisis. In less than three weeks, our expensive and valuable GPS satellites will be unable to provide even a basic fix.“

Moore reappeared. „Here, with a related piece, is INN's defense correspondent, Mark Markin.“

Markin appeared in front of the animated Dragon Gun again. „I interviewed Mr. Michael Baldwin, a well-known expert on the NAVSTAR GPS system. I asked him how long the system would be able to function under continued Chinese attacks.“

Baldwin was a slim, long-faced man in his fifties with a short gray haircut. He sat against a backdrop of jumbled electronic equipment and computer screens. He spoke with ease, secure in his knowledge. „The constellation's been severely affected. There are few places on earth now where the military can get the kind of accurate fix it needs for missile guidance or precision navigation. There are a lot of places worldwide where civilian users can't get a basic fix. This has affected not only airline travel, but also more basic functions like rail and truck shipping. We've come to expect that GPS will always be there, like the telephone or electricity.“

„How long before it ceases to be any use at all?“

„If the Chinese continue shooting down satellites at the rate of one a week, on November 25 it will be completely unusable.“

The reporter asked, „Some people are saying that if we can't destroy the gun with Tomahawk missiles or air strikes, we should use nuclear weapons. What do you think of that?“

Baldwin seemed surprised by the question, but answered it quickly. „Nobody's died yet, but they're hurting the economy, and the military's ability to fight. It's too deep inside Chinese territory for anything but a ballistic missile, but I don't want us to use nuclear weapons. I don't know anyone who does.“ He grinned. „I'm hoping this *Defender* is real.“

Markin asked, „Can we do anything to repair the constellation?“

Baldwin shook his head. „Not until they can protect the satellites somehow.“

„So we shouldn't launch any replacement satellites right now?“

The expert shook his head. „That would be lunacy.“

Space Force Headquarters, Miramar

November 15

„Be glad you're such a bad typist.“ The Security director's face was grim, but his tone was triumphant. He stood before McConnell's wall display, which held a diagram. It repeated the same symbol, an icon-sized image of the *Defender* document file. Starting at the left, it was labeled McCONNELL. Line segments connected it to other nodes, each labeled with a name and sometimes a date.

„INN took off the version number, trying to hide the source, but each version of your design had different typographical errors. We were able to determine the version number and its creation date in a half a day.“

„Checking the e-mail records you gave us, we found out who received this version of the design. We also could make a good guess as to when INN got their hooks on it. We got a lot of cooperation from some of the addresses, and not much from others, which in itself helped us focus our search.“

Ray had listened to the presentation with both anger and fear. INN's scoop had devastated morale. Secrecy had been part of their strength. It allowed them to move quickly, unhindered. Now friend and enemy alike could interfere with a timetable that had no room for delay.

He knew *Defender* was a long shot. The Chinese now knew where they were. Could they take some sort of counteraction? Even well-meaning friends could derail the project.

The Army colonel handed Ray his data pad. „Here's the report. I've found two individuals, one at SPAWAR and the other at NASA. Both received copies of this version, third-or fourth-or fifth-hand, and according to investigators I sent out, both have openly criticized *Defender*. One, at NASA, was quoted saying that, *Defender* had to be stopped. It could interfere with NASA's plans for developing spacecraft technology.“

Ray nodded, acknowledging the information, but not responding immediately. The colonel respected his silence, but obviously waited for a reply. McConnell wanted to strike out at these people, but there was little he could do.

Ray stated flatly, „The *Defender* document was never classified, so it's not a crime to release it.“

„The ones who gave it to the press certainly weren't our friends,“ countered the colonel. „And by exposing us, they've hurt our chances of stopping the Chinese. I'd say that's acting against the interests of national security.“

„By the time we indicted them, it would be moot. Our best revenge will be to succeed.“ Part of Ray didn't agree with what he was saying, but he was trying to think with his head, not his emotions.

„I could give it to the press. Fight one leak with another,“ suggested the colonel.

McConnell shook his head slowly. „Tempting, but that would open the door to more accusations and counteraccusations. I need you for other things, now. All our energy has to go toward finishing *Defender*. We don't have to provide a cover story anymore, but we have to assume they'll try to attack us at this location. Increase our defenses accordingly. If we need to bring in a Patriot battery or a division of paratroopers, that's what we'll do.“

„Meanwhile, I'll report to Schultz.“ Ray knew Schultz wouldn't enjoy his decision, but he knew it was the right one.

The colonel left, and Ray started to get up, to go report to his boss. But Schultz would want to know what they were doing about the exposure, and Ray knew that just increasing security wasn't the full answer.

Opposition to *Defender* was forming fast. Ray had assumed that there would be opposition, but he'd been so behind the idea he couldn't look at it objectively. Web pages already? Congressmen could order the program stopped or delayed for review.

The war in space had turned into an information war. Anyone who'd seen the news knew the media would pick up and report anything that was fed to them. Well, it was time for him to do some of the feeding.

He opened the address book on his data pad. He had contacts all over the defense and space and computer industries. They'd helped him get *Defender* started. Now he needed them again.

He started typing. „*Defender* needs your help...“

Six

Assembly.

Gongga Shan Launch Site November 17

Shen had insisted on having the meeting here, in the shadow of the mountain. Ignoring the recall order to Beijing had seemed suicidal, but the general knew that once away from the mountain, any flaw or error here could be blamed on his neglect. So far, the gun had worked perfectly, but that had just made him a more important target.

Friends in Beijing kept him informed. There were those who resented his success, even if it helped China against the U.S. There were those who wanted to weaken him, then take over the gun for their own political empires. Some simply thought he had too much power.

He'd been able to fabricate some sort of excuse for remaining on the mountain, and to his relief Dong Zhi had backed him up. He'd expected the scientist to do so, but the first rule of Chinese politics was that trust was like smoke. When it was there, it blocked your vision. And it would disappear with the first puff of wind.

Instead, Dong and what seemed like half the Politburo now sat in the observation gallery, while an intelligence officer briefed them on the new American warcraft.

The Army colonel had passed out edited copies of the original design, annotated in Chinese with an engineering analysis attached. He'd reviewed the systems—the laser, the projectiles, the radar and laser sensors. The general, Dong, and the other technical people present had been fascinated. It was a dangerous craft. Shen noticed that the politicians had spent more time gazing out the window. Had they

already heard it? Or were the exact details unimportant? Maybe they'd already decided.

The colonel finished his briefing, but the Politburo members wanted definite answers. When would it be ready? Would it interfere with the Dragon campaign? How could it be countered?

The colonel refused to make any conclusions. „We're still gathering information, Comrade Secretary. We have no information on how much they've actually accomplished. We're moving agents into place, but it takes time to infiltrate even with normal security, and the safeguards around the Miramar base are extremely tight.“

Shen spoke up for him. There was no risk in stating the obvious. „If their design works as shown, it can interfere with our satellite attacks.“

„And the chance of that happening?“ Pan Yunfeng demanded. The First Secretary had headed the delegation himself.

„Impossible to say, Comrade Secretary. However, this is not something they can build in just a few months. While the VentureStar space vehicle is complete, it had not yet been fully certified for service. It will have to be adapted to the new role, and many of the systems he describes do not exist.“

„Is it possible that this is a disinformation campaign?“ Pan asked the briefer.

The colonel looked at Shen, who nodded. „Unlikely, sir,“ the intelligence officer assured them. „The American administration is suffering intense criticism because of this now-exposed secret project. They've gained nothing from the revelation.“

„Then what is its purpose?“ Pan asked.

Shen replied again, his tone carefully chosen, almost casual. „Oh, they're building it, all right, but there will be very little to defend once it is operational. By that time, the new *T'ien Lung II* will also be ready. It has stealth features, more energy, armor, and it's semiautonomous. And we have designs for our own armed spacecraft.“ Shen smiled, imagining Chinese ships orbiting the earth, shattering America's military hegemony.

„We'll use the Dragon's Mother to keep them on the ground. We can destroy anything they launch.“

Kunming Air Base, Xichuan Province November 18

The aging II-76 transport lumbered off the taxiway and stopped. A cluster of uniformed Chinese and Russian military personnel waited on the tarmac. The instant the rear ramp touched the surface, they ran aboard, and only a few minutes later, the huge GAZ missile launcher rolled out of the aircraft.

The forty-five-foot wheeled eight-by-eight truck inched out of the transport and down the ramp. Four canisters took up two-thirds the length of the vehicle, overhanging the end of the chassis.

The command and radar vehicles were already on the ground and had moved off to a clear area to one side of the hangars. Technicians swarmed over the two vehicles, checking them quickly before letting them proceed. Rail cars and loading equipment stood ready.

The first battery, consisting of the command and radar vehicle and eight launcher vehicles, was already emplaced around the base. It would protect the airfield while the rest of the equipment arrived.

National Military Command Center, The Pentagon November 19

„At least three batteries of S-400s have arrived so far. One was used to cover the airfield, while one was sent by rail to the Gongga Shan launch site. We believe the other will be used to cover the Xichuan control center.“

None of this was good news, but Admiral Overton had more to tell. He displayed a list of Russian military units, along with their strength and their location.

„Additional Russian forces, including aircraft and more SAM units, are heading for the Chinese border. These are not weapons sold to China, but active Russian units stationed in the Far Eastern Theatre. I believe that these units are going to deploy to Chinese bases.

„Although they're deployed defensively, they will free up Chinese units to move south. More disturbing are the close military ties these represent. Russian official statements have always supported the Chinese in the Vietnam crisis, but they've been quiet about their attacks on our GPS satellites. These movements may indicate that they've decided to take sides.“

Overton saw their reaction, and mentally throwing the rest of his presentation over his shoulder, just summarized the rest. „A North Korean MiG-29 squadron has moved across the border, while other North Korean units are mobilizing.“

He put a new list on the display. „Indian and Indonesian forces are mobilizing, for reasons not clear right now. There are even signs of activity in Iraq.“

„We've only seen the early signs of mobilization, but if they continue, other powers like Japan, South Korea, and Malaysia, will have to follow suit.“

General Kastner looked thinner after almost two months of crisis. He listened to Overton's brief quietly, then asked, „And the Chinese are still completely ready?“

„All the deployed units are still in place, sir, and they've begun mobilizing other units throughout the country. Half their fleet is at sea or ready for immediate steaming. Stockpiles at staging areas near the Vietnamese border have actually increased, and thanks to the Russians, the Chinese will probably be able to protect them better. They could attack the Vietnamese with less than twenty-four hours' notice.“

„They certainly know about the congressional resolution,“ fumed Kastner. Opposition members in the House had started a resolution cutting funding for troops in Japan and Korea. „With Russia and North Korea holding her coat, the Chinese may now feel free to act.“

Kastner looked at the assembled service chiefs. „Are there any other comments?“ Only the Marine general spoke. „The Chinese know they have a free hand—against Vietnam, Taiwan, wherever they want.“

The Chairman said, „We all know the status of *Defender*, and their request for more time. Do we recommend for or against the replacement satellite launch? General Warner?“

The Air Force Chief of Staff controlled the GPS constellation, although it was used by all the services. „I'd hate to waste the last replacement satellite, sir. We've contracted for new birds, but it will be a long time before they're ready. I say hold it until after *Defender* proves herself.“

„If we go to war, we'll need any GPS capability we can get.“ General Forest, the Army Chief of Staff, wasn't shy. „Even if we can't get full coverage, more partial coverage is better than less partial coverage.“

„And when that coverage is lost? We only have the one spare GPS bird,“ Kastner reminded him. „Once we lose that satellite, we're helpless.“

„The Chinese will shoot down one GPS satellite a week whether we launch a new bird or not. This buys us a week. Putting it in my terms, we're fighting a rearguard action, trading casualties for time.“ The soldier looked grim, but determined.

„And we hope for the cavalry,“ Kastner concluded. „I'll make the recommendation.“

Space Force Headquarters, Miramar November 21

Biff Barnes resisted the urge to shout, give orders, or any kind of direction. These people were supposed to do their jobs on their own. He'd be too busy to give orders when the time came.

Jim Scarelli, the designated pilot, was off working on the flight-control systems with the techs. The Lockheed Martin test pilot for VentureStar, there was no question of his ability to fly *Defender*. That part was easy.

The rest of them struggled to train on half-built systems in a jury-rigged simulator. Six metal chairs mimicked ejection seats, and plywood and plastic boxes pretended to be control consoles. A plywood arch covered them, because many of the controls were positioned on the overhead. Network and power cables were tightly bundled, but still required attention to avoid a misstep.

Steve Skeldon, the navigator and copilot, sat in the right front seat. A Marine captain, his time flying fighters was less useful than his master's degree in physics. That morning, he had taken over Scarelli's flight duties as well, which made him a very busy man.

Behind the pilot, Sue Tillman, the sensor officer, pretended to scan the earth and space. An impressive array of infrared, visible light, and radar equipment was being installed in *Defender*. Hopefully it would act like the mocked-up control panels. She also took care of the voice and data links that would tie *Defender* in to the ground-based sensors she needed.

The weapons officer on the right was Andre Baker, a captain in the U.S. Army. Although he had no flight experience, he did know lasers, and he was a ballistics expert as well.

Biff sat in the rearmost row. As mission commander, he didn't need to look out the window. The displays on his console gave him the big picture. From the back, he could also watch his crew.

Ray McConnell's chair, for the flight engineer, was on Biff's right, also in the rear. It was empty, as well. Ray was able to train only occasionally, but that was the least of Biff's worries.

Barnes worked the master console at his station. In addition to simulating his own controls, he could inject targets and create artificial casualties for the team to deal with. Right now, he was just trying to get the simulator's newest feature to behave.

„Sue, tell me what your board sees.“

„Bingo! I've got an IR target, below us bearing two seven zero elevation four five. Shifting radar to classification mode. I'll use the laser ranger to back up the radar data.“ She sounded triumphant, and somewhere behind Biff, a few technicians clapped.

„Velocity data is firming up. It should be showing up on your board.“

Biff checked his own console, and said „Yes, it is.“ He'd dialed in a *T'ien Lung* target for Sue to find, and she had. Considering they'd just installed the infrared detection feature at four that morning, it was a significant achievement.

In spite of the frustration and lost time, Biff smiled, pleased with the results. More than procedural skills, simulators taught the crew to work together through shared experience. These experiences weren't what he'd planned on, but the result was the same.

„It's good to see you smiling, Biff.“ McConnell's voice would have startled him a few moments earlier, but Barnes felt himself relaxing a little.

McConnell sat down in his designated chair, then clapped his hands. „Attention please! We're short of time, so we can't arrange a ceremony, but I believe these are yours.“

Everyone's eyes followed McConnell as he handed a small box over to Barnes. As Biff's hand touched it, a photoflash went off, and he turned in his seat to see a photographer behind him, smiling, his camera still ready.

He opened the small dark box to see a pair of golden oak leaves.

„We thought *Defender's* mission commander should be at least a major.“ Admiral Schultz stepped into Barnes's view, reaching out to shake his hand.

Barnes, surprised and pleased, automatically tried to stand, but was blocked by the console.

„At ease, Major,“ smiled Schultz. „I'm glad to be the first one to say that.“ As Biff took the admiral's hand, both automatically turned their faces to the cameraman, and the stroke flashed again.

„Thank you, sir.“

„Don't thank me, thank Ray. He's the one who insisted you should wear oak leaves. A full year ahead of zone, isn't it?

„And by the way,“ Schultz said, raising his voice so the flight crew could all hear him clearly, „you're all going to get astronaut flight pay, backdated to the day you reported here for duty.“

It was Ray's turn to look surprised. Schultz just smiled. „You had a good idea. I had a good idea.“

INN News,

November 23

„Preparations to launch the only available replacement GPS satellite have brought a storm of criticism down on the administration. With only two days until the generally agreed-on deadline date, some observers have interpreted this as a desperate attempt to buy time. Others have suggested that this satellite will be used as part of a U.S. offensive, or that the satellite is being wasted in some American act of defiance.“

Senator Rutledge’s image, at the podium of the Senate floor, thundered with indignation. „Has our leadership lost all sense of reality? Having lost billions of dollars’ worth of hardware, we’re about to throw away another few hundred million. This is more than insanity.“

Markin’s image reappeared. „Congressional support is growing for some sort of accommodation with the Chinese. Few here believe the not-so-secret *Defender* project will ever get off the ground. The latest buzzword around the halls of Congress is *the new reality*.“

Seven

Deadline.

Xichuan Space Center, China November 23

General Shen watched Markin’s report with pleasure. American political will was beginning to weaken. Pan Yufeng, however, did not see it as clearly.

The Party Secretary, along with his aides, had watched the piece, with Chinese subtitles added. He’d only seen the problems.

„Why are they launching another navigation satellite? And how real is *Defender*?“ He turned to face Shen, his tone accusing. „Your entire plan was based on the premise that the Americans could do nothing before we gained control of orbital space.“

The man’s frightened, Shen realized. He’s betting his political life on something he doesn’t really understand. He’s used to controlling everything, and he can’t control this. He’s already trying to set me up, digging my grave if this fails.

„We do control space, Comrade Pan.“ Shen controlled his voice carefully. He had to be respectful, but the Party Secretary needed a dose of backbone. „Right now, we can kill anything in low or mid-level orbit. Soon, we’ll be able to attack even geosynchronous satellites.“

„This conflict, any conflict, is about wills. We want to impose our will on the Americans. We’ve shown them how vulnerable they are in space, and how that vulnerability affects them down here. They are starting to realize that. Their will is starting to break.“

„*Defender* is their last hope. We're ready for it. We know enough about the VentureStar design to guess at her performance, and we know they'll be launching from California. Within minutes of her launch, we'll be able to take action.“

Space Force Headquarters November 25

Ray McConnell tried to stay focused on the tour as Jenny Oh explained the Battle Center's status. He hadn't seen much of her in the past two months, although they were on the same base, working toward the same goal. He'd wanted to see her, of course, but he didn't need distractions.

Originally, she'd been assigned to set up the communications network that would support the mission. It was an immense job. She had to integrate links between Air Force's Space Command, Navy tracking stations, NASA, and even some civilian facilities. It had to be done quickly and with the real purpose secret.

All that data would be fed to a single point, the Battle Management Center, and her task had such an impact on the Center that she ended up taking over that, too. She'd done both jobs well, almost elegantly.

They'd set up the Battle Center in an empty service school. The classrooms and offices were taken over by the support staff, and the large central bay, which had housed a simulator, now held the command display. The building itself looked weathered, worn, and misused by its new occupants. The few windows had been covered, and other modifications were left raw and unpainted.

She'd met him at the door, standing proudly under a sign that said „Battle Management Center“. He'd been glad to see her, of course, and had felt a little of the tension leave. He'd smiled, but it might have been a little larger than he'd intended. She smiled back, but it was a tired smile.

She seemed different, and he realized she looked harder, a little thinner, and wondered if the strain showed on him as well.

Jenny led him down the central hallway, past security, past rooms crammed with electronic equipment or people hunched over workstations. There was more security at the door to the Display Center, and a vestibule that served as a light lock.

They entered the darkened two-story room in one corner. An elevated scaffold had been erected that ran around three sides of the room. It was about fifteen feet wide, with a waist-high rail on the inside edge. The fourth wall was lined with gray equipment cabinets, and Ray could see more boxy shapes tucked under the scaffolding.

Jenny trotted up the steps to the scaffolding, putting them one story up, then led Ray along the walkway. Desks lined it, facing the center, with an aisle behind them. „This section's communications, that's electronic warfare, that's intelligence.“ They turned the corner. „This wall is spacecraft systems. We don't get a tenth of the telemetry that NASA gets, but we still monitor critical systems.“

They turned the last corner, and she pointed to the last group, on the third side. „Admiral Schultz and his staff will sit here. I've got communications rigged to the White House, the NMCC, and to all the major commands.“

He looked around the space. Everything was neatly arranged. The cabinets were fully installed. They'd even taken the time to paint safety warnings near the stairways. „It looks great, Jenny. You've done a wonderful job.“

„Don't praise me yet,“ Jenny replied. „It's looked like this for almost a week. The real test is what's inside.“

She walked over to one of the desks, labeled „Staff“, and picked up a virtual-reality headset. It was an older model, and still had a cranial framework to hold the eyepieces. Slipping it on easily, she pulled on the gloves and touched a switch on the headset. He heard her say „Begin test three bravo.“

The center bay, until then dark and empty, suddenly filled with a bright white sphere, easily ten feet across. It floated in the air halfway between the floor and the ceiling. Ray barely had time to see it before it changed color, becoming a deep blue. Patches of blue lightened to a medium shade, then lightened more, shifting to brown and green. He realized he was watching the world being built, starting with the deepest part of the ocean. Then higher elevations were added, one level at a time.

As Jenny tapped the air with her data gloves, points of light appeared on the surface, and Ray recognized one as Miramar. Lines appeared circling the earth, and he knew they were orbits.

Visually, it was stunning. The implications for command were even more impressive. It was the situational awareness a commander needed to fight a worldwide battle.

„Here's the hard part,“ Jenny announced. A flashing symbol appeared in southern China, becoming a short red line segment. A transparent red trumpet appeared around the symbol as it quickly climbed toward orbit. „This is a recording of their last intercept,“ she told him, taking off the helmet and watching the large display. „Here's what we added.“

A new point of light flashed, at Miramar. It started to rise, and the display went dark.

The sudden blackness left Ray momentarily blind, and he heard a loud, „Damn! I wanted that to work.“ He could hear the frustration in her voice.

„The gear was a piece of cake. This display duplicates the one at Space Command, and I could get off-the-shelf components for nine-tenths of what we needed. Hooking it up was straightforward.“

„But programming in the new systems has been difficult. We have to be able to track *Defender* in real time. The display was originally designed to show a friendly unit's location based on GPS data. We can't depend on that, so we're using radar and optical sensors all over the world to track your position. That information has to be collected and fused, then sent to the display. That software is all brand-new.“ She smiled a lopsided smile. „I hear they're having a lot of problems at Space Command as well.“

Ray waited for a moment, then asked quietly, „Is there anything we can get that will help you finish on time?“

She shook her head. „I wish I knew what to ask for.“

Her tone shook McConnell. He heard someone near the end of her rope. She'd accomplished miracles, but in a week this gear had to be rock-solid. *Defender*

needed guidance from the Battle Center. They didn't have the onboard sensors to run the entire engagement from the ship.

He couldn't bring in more people. At this late date, they'd have to be brought up to speed. They wouldn't be ready in time. She certainly didn't need any more gear. If she had the resources, then it was all about leadership.

„You can do this,“ Ray said carefully. „I can't give you a sunshine speech. Nobody's more committed to *Defender* than you, but I think you're afraid of failing. You care so much about the project that the fear of not making it is tying you up in knots.“

She almost shook as she nodded. „I don't like to fail. I never have, more so than most. And this is especially important.“ Jenny's fatigue was more evident now, as she leaned heavily on the rail.

Gently taking her arm, Ray led her over to a chair and sat her in it. He sat on the edge of the desk. He looked at her steadily.

„You've been a rock for me since the day this began. But also since that day, there hasn't been the time I'd like for us. I've had to stay focused, and that's meant putting my feelings for you in deep freeze, until this is over. Your belief has kept me going. I hope my belief in you can do the same.“

She smiled and looked up at him. „I want it to.“

„Then it will.“ He stood. Ray tried to sound positive without being too enthusiastic. „We will make it, Jenny, and I'm glad you'll be here in the Center when I'm up.“

Ray's phone beeped, and, reluctantly, Ray answered it. It was Admiral Schultz. „They're moving,“ he said without waiting for Ray to speak.

Ray didn't have to ask who. „Where? What are they doing?“

„Imaging satellites have been watching along the southern border. They're leaving their staging areas. They'll be in position to invade at first light tomorrow.“

National Military Command Center November 26

„There has been no communication from the Chinese government, either to us or to the Vietnamese.“ Secretary Peck sat next to General Kastner. He'd listened to Admiral Overton's briefing on the movement of Chinese and Vietnamese forces. Now he added a few more details, things the Joint Chiefs weren't normally privy to.

„The Chinese have purchased Russian and North Korean assistance with promises of economic concessions in Vietnam and the Spratlys.“

General Forest, the Army Chief of Staff, started to laugh, out of surprise, but stopped himself.

Peck nodded. „I agree. Normally I'd say Moscow and Pyongyang would be fools for agreeing to such an arrangement. Talk about a pig in a poke.“

„But the source is reliable,“ insisted Peck, „and we believe it shows what they all think of our chances. We've been top dog for a long time, gentlemen, but some of the dogs don't think we're that tough any more.“

„It's still a bargain made in hell,“ Kastner remarked.

Peck nodded. „The President publicly committed us to defend Vietnam from Chinese aggression. Now it's time to put up or shut up.“

„The reasons for defending Vietnam haven't gone away,“ Forest reminded them.

„But the job's gotten a lot harder,“ said General Warner. Air Force and Navy aircraft would have been the weapons used to stop Chinese forces. Now, their power was reduced, and their vulnerability increased.

„That was the entire purpose of the Chinese plan. They knew we would commit ourselves publicly if our risk was low, and once we committed, they changed the game. It was a setup from the start, and we're trapped.“

„It would still be bad if they overran Vietnam,“ Admiral Kramer observed. „There'd be an economic cost, and domestic and foreign political cost.“

„The damage to our reputation abroad could be severe,“ agreed Peck.

„*There go the Americans again, not keeping their promises,*“ chimed in General Forest. „Let's use a Chinese term. It's about face. They've already gained some by giving us a black eye, and it's paying off. Does anyone want to guess how many new friends they'll have if they actually take over Vietnam?“

General Kastner shook his head. „We can't trade lives for pride.“

„I have to disagree, sir,“ countered Forest. His tone was respectful, but firm as well. „That isn't the tradeoff. It's fight here,“ he paused looking around the room, „and lose some people, or fight later in a lot of different places, and against a stronger enemy. Does anyone think the Chinese will stop here? They've already promised their allies a piece of the Spratlys!“

Peck said, „What if we change the rules? Can we increase their cost?“

„Widen the war,“ said Kramer. „Threaten them anywhere and everywhere. We can't hit the gun, but there are a lot of targets that are in Tomahawk range, or in range of carrier aircraft. We can sink every naval unit and shoot down every aircraft we can find. And we know about the Spratlys,“ he said, nodding toward Peck.

„Wide-scale warfare,“ Kastner wondered out loud, but then his voice changed. „Hit them where they can't hit us back. I agree.“

Peck nodded. „It's an option. I'll convey your recommendations to the President.“

USS RONALD REAGAN (CVN-76) in the South China Sea November 27

On the flight deck, everything was normal, if a maelstrom of noise, metal, and hot exhaust can ever be called normal. Rows of strike aircraft sat armed and ready, while fighters and radar-warning aircraft took off and landed at regular intervals, protecting the task force.

The pilots' orders were clear. Push right up to the Chinese coast. Shoot down any aircraft in Chinese markings you find, sink any ship flying the Chinese flag. But don't cross the coast. Not until we're ready.

Below in plot, they were still trying to get ready, hours after targets had been assigned and authorization received. Squadron commanders waited impatiently while the planners struggled and argued.

The target list was ambitious, with primary, secondary, and tertiary targets assigned to each aircraft. Defense-suppression missions were supposed to arrive moments, just seconds before the strikers made their runs. Enemy defenses were supposed to be located by reconnaissance UAVs that would data-link the position back to command aircraft. Those planes would in turn task in-flight aircraft to attack those targets.

But every step in that process involved a position— a GPS position. The heavily automated precision-targeting systems had to be adapted to other, less precise navigation systems. Those systems had errors, much more error than the planners were used to. In many cases, the errors were too great for the precisely timed tactics of the manuals.

The strikes would launch, late, and the planners could not guarantee that all the strikers would come back.

Space Force Headquarters, Miramar November 29

Ray heard the klaxon in his office. He ran outside, expecting to see fire engines racing by. His first thought, of the hydrogen and oxygen tanks at the pad, was so frightening that his mind raced, searching for some other emergency. A toxic spill? Did someone fall? Terrible things to hope for, but better than a fire in the fuel area.

He rounded the corner of his office building, which gave him a clear line of sight to the launch compound. It was over a mile away, but seemed normal. Then he heard machine-gun fire. He ran faster.

An open-topped Humvee loaded with armed Marines roared past and he waved frantically, and yelled, still running. He heard someone recognize him. „It’s McConnell, hold up,“ and it skidded to a stop.

They made room for him in front and he jumped in, the driver flooring the accelerator. Someone behind yelled into his ear over the noise of the diesel engine.

„It’s a full alert. Radar’s detected a slow-moving aircraft headed for the base. He’s already inside the prohibited zone, and he won’t answer on the radio.“

The street ended, and the open area surrounding the launchpad replaced the buildings on either side.

McConnell heard the machine gun again, and located the firer from the sound. It was another Humvee with a pintle-mounted machine gun. They were stopped, and the gunner was pointing his weapon up. Ray followed the line of tracers, and saw a small speck. It looked like a light plane still a few miles away.

„He can’t hit anything at that range,“ Ray shouted.

„He’s trying to warn him off,“ the driver shouted back. Ray noticed the driver was an officer, a Marine lieutenant. The Marine picked up the vehicle’s radio microphone. „This is Hall. I can see him. It’s a light plane, a Cessna or something like it. He’s at low altitude, and he’s headed straight for the pad complex.“

„What’s he going to do?“ asked McConnell.

Lieutenant Hall shrugged. „You tell me. It could be a suicide crash, or loaded with commandos. Or he could drop leaflets that say *Save the Whales*.“

Hall continued at breakneck speed, arriving at the hangar after the longest sixty seconds of Ray's life. As the vehicle braked, Marines jumped to the ground and ran to take up positions covering the hangar and its precious resident.

Ray could see other squads racing into position, and more weapons opened up on the approaching plane. It was closer, and he could hear the plane's small engine snarl as the pilot opened up the throttle. Its speed increased slightly, and he lowered the nose. Was he going to crash the hangar?

Tracers surrounded the plane. Ray knew intellectually how hard it was to hit even a slow aircraft with a machine gun, but right then he was infuriated with the gunners who couldn't hit something that large, that slow, flying in a straight line.

It was even closer, and he could see it was a high-winged civilian plane, a four-seater. He'd flown them himself. It was nose-on, headed straight for him. The drone of the engine increased quickly, both in pitch and volume.

Although he couldn't see any weapons, he suddenly felt the urge to run for cover, but they hadn't planned for an air raid. The hangar was poor protection. Besides, wasn't that what they were aiming for?

Something fluttered away from the side of the aircraft, and for a moment Ray thought the machine gunners had actually hit. Then he recognized the shape as one of the side doors. A parachute jump? But they were too low, no more than five hundred feet.

They were almost at the hangar, and the Marines nearby had raised their weapons, tracking the plane but not firing without an order.

„Hold fire!“ Hall shouted, then repeated the order into the radio. He turned to Ray. „If we hit it now, it could crash into the hangar.“

„Assuming that isn't their plan,“ Ray muttered.

McConnell watched its path, wishing it would vanish. It didn't, but at the last moment it did veer a little to the left, and in a few seconds Ray was sure it was not headed for hangar. He couldn't feel relief.

The plane was headed for the launchpad, about a hundred yards away. He saw a man-sized object leave the plane and drop toward the ground. It had fins on one end and a point on the other. It looked like nothing so much as a giant dart.

Ray stood and watched the object fall, looking even more dartlike as it fell nose-first. Out of the corner of his eye, he saw that the Marines, with better reflexes, were all hugging the ground.

It struck almost exactly in the center of the pad, exploding with a roar. The concussion was enough to stagger him a hundred yards away, and misshapen fragments cartwheeled out from the ugly brown smoke cloud.

Ray was still standing, dazed and unsure of what to do next, when a pair of Marine SuperHornets zoomed overhead in pursuit of the intruder. His eye followed the jets as they quickly caught up with the Cessna, still in sight, but headed away at low altitude.

One of the Hornets broke off to the right, then cut left across the prop plane's path. McConnell heard a sound like an angry chain saw, and a stream of tracers leapt from its nose in front of the trespasser. The other jet was circling left, and had lowered its flaps and landing gear in an attempt to stay behind the Cessna.

Lieutenant Hall's radio beeped, and he listened for a minute before turning to Ray. „They've ordered him to land, and he's cooperating.“ Glancing at the lethal Hornets circling the „slow mover,“ he said, „I sure would.“

Remembering the bomb, Ray ran over to the still-smoking pad. Acrid fumes choked him, but he ignored them, then almost stumbled on the debris littering the once-smooth surface. Slowing down, he picked his way over metal fragments and chunks of concrete.

His heart sank when he saw the crater through the clearing smoke. Easily three meters across, it was at least that deep. Torn steel rods jutted out from the sides at crazy angles.

Admiral Schultz came up through the smoke, standing beside Ray and gazing at the crater. Ray saw Schultz look him up and down, then ask, „You look fine. Is everyone OK?“

Ray stared at him for a minute, then replied, „I don't know.“

Schultz shook him by the shoulder, not roughly, but as if to wake him. „Ray, snap out of it. We've got to check for casualties, and see what the damage to the pad is. We can't let this slow us down.“

Ray nodded, and started to check the area. He spotted people he knew, and set them to work. He saw Marines working as well, moving from person to person, making sure everyone was all right, helping some who were hurt.

Lieutenant Hall trotted up to Schultz and saluted. „Sir, they've got the intruder lined up for landing.“

„Right, let's go, then.“ He called to McConnell. „Ray! Can you come?“ McConnell had overheard the lieutenant and was already heading for the Humvee.

The lieutenant drove almost as fast to the runway as he had to the launchpad. It was located on the part of the base still being used by the Marines, and at speed, it took five minutes to cover.

Ray saw armed patrols all over the base and signs of heavier weapons being deployed. Wheeled vehicles with SAM launchers on top rumbled by, and he saw a column of tracked fighting vehicles being loaded and fueled.

A sentry at the end of the airfield spotted the Humvee's flashing light and waved them onto a taxiway, pointing to the far end. A cluster of vehicles surrounded the Cessna, and the two Hornets whoostled overhead, as if they were daring it to take off.

Ray recognized General Norman, standing to one side, as armed Marines secured the plane. Its two occupants were being half-dragged out of the plane and efficiently searched. A man and a woman, both were in their early twenties, dressed in fashionably mismatched pastel colors, their hair short on top, long on the side. To Ray's eyes, they looked like a couple of college students, straight off the campus.

„Don't put weapons in space!“ one of them shouted as he was searched.

„Down with *Defender!*“ the girl shouted. „We won't let you turn space into a battlefield.“

Ray was in shock. He wanted to grab the two of them, show them the damaged pad, the injured being taken to the hospital. Or show them the Battle Center, and what was at stake.

General Norman's face was made of hard stone, and Schultz looked ready to order two executions on the spot. But they weren't moving or saying a word. Maybe they couldn't. But Ray didn't either. He watched the MPs cuff the two civilians and lead them away.

Later in the day, Ray reported to the admiral. Schultz's office was filled with people. General Norman occupied the only other chair, but a Marine JAG officer, the base's Public Relations officer, and Defender's Security officer took up most of the remaining floor space. They'd all been waiting for Ray.

He didn't bother with introductory remarks. „The engineers say they can fix the pad by tomorrow evening. They'll use the same stuff they use to repair bombed-out runways. It won't be worth much after *Defender* uses it, but it will be fine for the launch. Some of the handling equipment was damaged, but again, it can be repaired quickly.“ He half smiled. „One of the advantages of jury-rigging all this gear is that it's pretty easy to fix.“

Schultz just said, „Thanks, Ray,“ and turned to the Security officer.

„They're not Chinese agents, or if they are, the Chinese are making some bad personnel choices. Their names are Frank and Wendy Beaumont, and they're siblings, students at UCSD. They're well-known activists at the school, and belong to several political organizations. The plane's their dad's, and both have been taking flying lessons.“

„We think they had help with the bomb, but only from other students. It was an improvised shaped charge. The boy, who's a sophomore, described it in detail, and claims he did it all himself, but I doubt it.“

Schultz nodded, then looked at the Public Relations officer, a Marine major, who reported, „The press is having a field day with this. Half the headlines read, *Marines Fire on College Students*, and the other half read *Marines Fail to Protect Secret Spacecraft*. Either way we can't win. Some of them are even speculating that the *Defender* actually was damaged, and of course we can't show them that it isn't.“

Schultz replied, „Let them say it is. If the Chinese think we're hurt, that's fine. Also, show them the people who were hurt in the blast.“

„I just got off the phone with the hospital,“ he continued. „The total is five hurt, one seriously enough to need surgery to remove a bomb fragment. All of them will recover fully.“

„I'm glad nobody was killed,“ General Norman rumbled. „But we can't assume that there won't be another attack. I personally want to apologize for letting that plane get through. It won't happen again. The Commandant has told me I can have anything I need to protect you and this base.“

„For as long as you need it, we will stay at full alert. We're keeping fighter patrols and helicopter gunships overhead twenty-four hours a day. There will be no further interruptions.“

**Space Force Headquarters, Miramar
December 1**

Biff Barnes knocked twice on the door to Ray McConnell's BOQ, room, then tried the knob. It was unlocked, and as Biff opened it, he heard someone typing. Ray sat hunched over the keyboard, in his pajamas.

„Ray, this is supposed to be a wake-up call. Remember? I told you about something called *Crew Rest*?“

„I remembered something early this morning that I had to deal with,“ McConnell answered, his attention still on the screen.

„After dealing with stuff last night until one o'clock.“ Barnes dropped onto the edge of the bed. „I need you alert and at peak for tomorrow, Ray. When did you wake up this morning?“ His question had a slight edge to it.

„Four.“

„So you think three hours is enough?“

„Okay, I'll take a nap after lunch.“

„That's when we're supposed to review the new sensor handoffs.“

„Oh.“

„Join us halfway through,“ Biff told him. „Now I'll see you at crew breakfast in fifteen minutes.“

Barnes left and Ray quickly showered and dressed. In spite of his fatigue, it didn't take any effort to hurry, and Ray wondered what percentage of his blood was composed of adrenaline. He'd been running on nerves for way too long.

Feeling like a fool, he put on the blue coveralls Barnes had given him. The left shoulder had a patch that said U.S. SPACE FORCES, and the left breast had one that said DEFENDER, along with his name stenciled below it. Although they were attractive, if flashy, Ray didn't remember approving either design. When asked, Barnes had told him that some things were better left in the hands of fighter pilots.

Barnes had insisted on Ray wearing the coveralls at all times this week. „Of course it makes you stand out. You're flight crew, and that makes you different. Let everyone see it. You not only built Defender, you've got the balls to fly in her as well. That's the ultimate vote of confidence, and your people will appreciate it.“

The mess hall looked better and better. Geoffrey had changed the decor again, this time from Southwest to Space. Posters of starfields and spaceships filled the walls, and the classical music was appropriately grand.

Ray hurried over to the crew table, and was gratified to see he was not late. Steve Skeldon and Sue Tillman were also just sitting down. Both of them wore military insignia with their coveralls, and made them look natural. Ray thought he probably looked all right, as long as he stood close to one of them. He still felt like a pretender.

Instead of going through the cafeteria line, Ray checked off what he wanted on a menu data pad. The theory was that the crew should be doing useful work instead of standing in line, but it was just another perk, a way of making them feel special. Ray had allowed it reluctantly.

They did work, Barnes drilling them relentlessly on safety procedures, equipment locations, technical characteristics, and each other's duties. His favorite trick was to ask one question, then ask another in the middle of the answer. The victim had to answer both correctly, in order, within seconds.

At first Ray thought Barnes was picking on him, grilling him repeatedly on engine-out procedures. Then after watching him work over the others, McConnell thought Barnes might have been cutting him some slack.

The recital continued throughout breakfast, and Barnes prepared to take the crew to the simulator. Ray found that he wanted to stay with them, but knew that there were too many last-minute problems to fix.

Part of him couldn't wait for tomorrow morning. The rest of him wanted the day to go on forever. He needed the time.

INN News December 1, 2200

Mark Markin stood as close to Miramar's front gate as he could, which meant across Miramar Way, off Highway I-15. At night, there was still a lot of traffic on the arterial, but most of it passed by. The camera followed one heavy truck that did turn in, centering on the armed sentries that surrounded it and checked it carefully before allowing it to move on. It lingered on a dog held by one of the guards.

„Following the attack two days ago, the Marines here have increased security to extraordinary heights. Civilian traffic on and off the base has been severely restricted, and most of the traffic into the base has been official.

„All our attempts to contact the military regarding the damage inflicted by the attack have been fruitless. The Coalition against Military Space, which claims responsibility for the action, says that the launchpad was destroyed and a nearby hangar damaged. Major Dolan, the base Public Relations officer, still denies the existence of *Defender*, and is therefore unable to discuss damage to something that doesn't exist.“

A grainy black-and-white image replaced Markin. It showed a squarish building with rails leaving one side. They led to a rectangular flat area, with a girder structure in the center. The framework was undercut with a sloped trench. It could only be a spacecraft launchpad.

The image was skewed, as if the camera had been tilted well off the vertical. „This photo was taken from an INN plane flying just beyond the prohibited area over the air station. Using a special lens and computer enhancement, we were able to get this image of the *nonexistent* hangar and launchpad. While there is little that can be seen at this distance, the hangar and pad appear intact. Presumably, *Defender* is undamaged.

„INN news will monitor developments at the base closely and let you know the instant that there are any developments.“

Space Force Headquarters, Miramar December 1, 2215

Admiral Schultz turned off the wall display angrily. There was little pleasure in pushing a button. What he wanted to do was push in Markin's face. „War in a fishbowl,“ he grumbled.

Colonel Evans, *Defender's* Security officer, could only agree. „Radar's tracked civilian planes flying just outside the prohibited area. There's a good chance at least one of them is an INN plane with a TV camera aboard, waiting for us to launch.“

Schultz grinned. „Then let's give them something to look at. I need to talk to General Norman, and Jenny Oh. You might have to wake them, but tell them it's urgent.“

Evans asked, „How about McConnell?“

Schultz shook his head. „No, let him sleep. He can't help with this, and he's got a busy day coming.“ He stifled a yawn. „And once he launches, I'm taking a nap.“

Battle Center, Space Force Headquarters December 2, 0200

Schultz had found Jenny Oh at work, testing and refining the tracking software so critical to the mission. She also planned on sleeping after the launch.

Now she sat at the chief controller's desk, considering Schultz's idea. She was tired and worried, but it was an intriguing plan, even if it complicated these last few precious hours.

„We've run similar drills,“ she replied carefully. She couldn't give Schultz a resounding yes, much as she wanted to. She needed to think it through herself. „And my programmers could continue running their tests separately.“

„I don't want to do anything that interferes with readiness for the launch tomorrow,“ the admiral assured her.

„It would mean transmitting on the launch frequencies.“

„We have more than one set, don't we?“ he asked.

„Yes, but only a limited number. Once they're used, we have to assume the Chinese or anyone else will be able to monitor them.“

„But they're encrypted,“ Schultz replied.

„I don't assume anything,“ Jenny answered firmly.

„You're right, of course, but it's worth it.“ He looked at his watch. „I want it nice and dark, so you'll need to be ready by 0500 hours.“

„We'll be ready.“

Eight

Arrival.

Gongga Shan December 2

General Shen paced a path in the launch center. The staff, familiar with their duties, gave him a wide berth and paid attention to the upcoming launch. He left them to it. Events were taking their own course. He was no longer in complete control of the situation, and he hated it.

The launch base, always on alert for attack, was on a war footing. Every man of the garrison had been turned out, and patrols went out twice as far as usual. Flanker fighters ran racetrack patterns overhead.

They had cause to be concerned. American strikes up and down the coast had hurt the People's Liberation Army badly. Vital bases were damaged, ships had been sunk, and dozens of aircraft destroyed in the air. The Politburo had forbidden the services to discuss casualty figures, even among themselves.

Still, the American attacks had been carefully chosen to strike weak points. Heavily defended areas had been spared, so far. It was as if the Americans had lost confidence. They no longer believed in their invincibility. He hoped that feeling was right, because it meant they were weakening.

Shen knew it would be difficult for the Americans to strike so far inland, but he had to be prudent. Especially since this was where the real battle lay.

Li Zhang, the Premier, had asked the Politburo if they should seek some compromise with the Americans. Both sides stop shooting, in return for security guarantees. Pan Yunfeng, at Shen's urging, had finally convinced them to continue the launch program without interruption. Shen's reasoning had been irrefutable: Even if *Defender* really existed, there was no way to know when it would be ready to launch. A week? A month?

It was frustrating, but really irrelevant, since *Defender* would be destroyed soon after it took off. Shen was almost eager for the Americans to launch. Its appearance would resolve so much of the uncertainty he had to deal with. Its failure would break their will.

Miramar Marine Corps Air Station 0400

Admiral Schultz watched the pilot preflighting his SuperHornet. It was dark on the flight line, illumination coming from spotlights nearby. The drab gray camouflage scheme didn't reflect the lights, and the plane appeared to be built from angular shadows.

The fighter was unarmed, but carried three of the big 480-gallon drop tanks. The pilot paid a lot of attention to them.

General Norman had joined Schultz on the flight line. „It seems so simple,“ the general said, looking at the plane's payload.

„It'll work just fine,“ Schultz reassured him. „We used to have this as a problem with A-6s and F-14s. In fact, once the pilots found out how to do it, we had to explicitly forbid the practice. There are some risks.“

„Which Major O'Hara understands,“ Norman reassured him. „But I'm taking all this on faith. I'm just a dumb grunt.“

„And I’m just an old pilot.“ Schultz grinned at him. „I’m needed elsewhere. Would you care to join me, Carl?“

„I’d love to, Bill,“ replied the general.

Space Force Headquarters, Miramar 0400

Suiting up for the flight was still a novelty for Ray. He’d practiced the procedure twice before, also a fitting for the suit and other systems. Like the shuttle crew, they would work in a shirtsleeve environment, but for the launch they would wear the full rig.

McConnell moved through the morning in a haze. It didn’t feel real. It had happened too fast. He felt adrift. His role in building *Defender* and preparing her for flight was over. He was so used to the pressure of the deadline that he still felt it there. Like taking finals, it took a while to realize they were over.

Add to that the fulfillment of a dream. He would fly in space. He’d flown before, of course, in light planes that he piloted and joyrides in high-performance jets. This would be much different. He’d see and feel things he’d never seen or felt before.

He knew he was afraid. There were risks, of course. Mechanical failure or human error could bring them to grief, but it was the uncertainty of the mission that really frightened him. Did they have the right tools? Ray was so closely tied with *Defender*, he felt part of her, and the thought of her failing almost paralyzed him. He remembered his talk with Jenny, and tried to say to himself the words he’d said to her.

Space Forces Battle Center, Miramar, California 0415

The visit was as important as fueling *Defender* or loading her software. Led by Biff Barnes, *Defender’s* crew filed up onto the scaffolding surrounding the slowly rotating globe of the earth. They were dressed for the mission, wearing their flight suits and, purely for photo purposes, carrying their helmets.

Although nobody announced their arrival, someone, then several people, and finally the entire center clapped and cheered as they made their way to Admiral Schultz’s position.

Ray felt embarrassed and proud at the same time. He would depend on these people while he was up. In fact, without them he was helpless. But he and the rest of the crew were the ones taking the risks.

Biff Barnes understood it better. There’d always been a special bond between the people who maintained the planes and those who flew them. *Defender’s* crew was here to acknowledge that bond, and to let the support staff have one more look at the crew before launch. They were the stars of the show, but stars had to let themselves be seen.

Admiral Schultz also wanted to say good-bye and wish them luck as well. After this they would start the final launch preparations, and there'd be no time for ceremony.

Schultz shook everyone's hands, and had a few words for each member of the crew. When Ray took his hand, the normally outgoing admiral was silent for a moment, and finally just said, „Good luck.“

Space Forces Launch Center, Miramar, California 0430

The crew left the ready room together and walked outside. Only a few people saw them, but they clapped and waved at the six as they approached *Defender*.

Ray had visited Cape Canaveral several times, and loved the huge Vertical Assembly Building and the massive tracked transporter that carried the assembled shuttle on its six-mile-per-hour crawl to the launchpad. They were tremendous technical achievements, needed because of the shuttle's boosters and fuel tanks. They were also tremendously expensive.

That morning, before dawn, they'd brought *Defender* out of her hangar. Two rails helped them guide her onto the pad, where she was elevated to the vertical for launching. Fueling began as soon as she was locked in place. With an 0300 rollout, she'd be ready for launch at 0600. The sheer simplicity of the preparations amazed him.

She was still an overall white, a broad snowy wedge that reflected the work lights. The swept-back wings on either side only made her look wider and taller. The ship sat on a short framework, the beam used to elevate her now lowered again.

They'd left the American flag, but painted out the Lockheed Martin logo and the VENTURESTAR lettering. Star-and-bar insignia had been added on the wings and the center of the fuselage, top and bottom. Below the insignia, in black capital letters, was her name. To Ray, she was more than beautiful.

The crew access elevator took them two-thirds of the way up, where the square black of the open access hatch led them inside. The moment the last of them was in, technicians closed the hatch and removed the elevator.

Ray became wrapped up in the checklist. The six of them each had their own tasks, and had to work as a team to do it correctly...

Runway 15, Miramar Marine Corps Air Station 0530

Major Tim O'Hara smoothly lined up the jet on the runway. Night takeoffs required caution. The lights of the town in the background could confuse a pilot looking for a runway marker or a signal light. He set his brakes and watched the tower. As he waited, he checked his radio again. The transmit switch was off, and would stay off until he was ready to land.

The runway was dry and clear, the weather perfect. He fought the urge to double-check his armament panel. He did double-check that his nav lights were off. He wasn't supposed to attract any attention, and the tower would keep all other traffic clear. He heard them vectoring the standing fighter patrol to the far end of the base.

A green light flashed from the tower, and he pushed the throttle forward to full military. The runway lights slid past him on either side, quickly becoming streaks. With long practice, he pulled back on the stick, feeling the ship almost leap off the runway. He cleaned her up, bringing up the flaps and gear.

Throttling back, he stayed low, and started his first turn quickly. Buildings rushed by frighteningly close below him, but the route had been carefully planned to avoid any obstructions. He had to stay low to avoid the civilian air traffic control radars. You could never tell who had tapped into their signal.

At jet speeds, he crossed the base almost instantly, and spotted the IP ahead. They'd decided to use the motor pool. After his turn there, it would be a straight shot to *Defender's* launchpad.

He banked precisely over the motor pool's parking lot, then pushed the throttle to full military again. Even at low altitude, he could see the pad ahead of him, and he pointed the nose straight at it.

The jet built up speed again, quickly passing four hundred knots, and passed over a small service building he'd noted on the map. It marked the spot where he had to begin his zoom.

O'Hara pulled the nose up sharply. By the time he'd reached the vertical, he was directly over the launchpad. He hit the afterburner, and an instant later, the DUMP switch on his drop tanks. Fuel sprayed out vents on the back of the tanks and was immediately ignited by the jet's exhaust.

Accelerating, he concentrated on keeping the nose straight up, and hoped someone was getting a picture.

INN News 0532

„FLASH. This is Mark Markin, INN News, outside Miramar. We've just seen a flame rising to the east.“ Turning to someone off-camera, he asked, „Is it still there? Get it linked!“

Markin's face was replaced by a bright red streak moving against a black background. Jerky camera motion gave the impression of great distance. The end of the streak flickered and wavered. It seemed to be going very fast.

„Less than a minute ago, a red flash appeared in a part of the base used by the *Defender* program. The flash shot up into the sky at terrific speed, and is now fading at high altitude.

„Without any announcement, and presumably to protect the American GPS constellation, *Defender* has launched.

„I say again...“

**Space Forces Battle Center, Miramar, California
0532**

General Norman watched INN's transmission, grinning. „That's what you get for peeping over fences,“ he joked at Markin's image. The INN reporter was rehashing the recent event yet again.

Schultz was listening on his headset, and watching Jenny move among the launch controllers. Instead of watching their screens, they read from a paper script. Normally used for training, it drilled the controllers in what they were supposed to say at each point as they guided *Defender* during its launch. They'd practiced the procedure dozens of times, but this time their transmissions were being broadcast. Nobody was sure who would be listening in, but if anyone did, they would hear what sounded like the real thing.

**Gongga Shan,
December 1, 0540**

From the look on the controller's face, Shen knew it was an urgent call. He took the headset and heard Dong Zhi's voice. „They've launched. It's all over INN.“

„What did they show?“ he asked, motioning to one of the technicians. Although they had access to the Internet, they were not allowed to link INN except in „special circumstances“. Shen thought this would qualify. Along with the launch staff, he watched the launch and heard Markin's commentary.

„Time of launch was 5:30 local, about ten minutes ago,“ reported Dong. „We've picked up increased radio traffic from Miramar, as well. We're calculating the intercept basket now.“

„We're still seventeen minutes from launch here,“ said Shen, checking the time. He could feel a pre-battle excitement build in him. The Americans had moved.

„I recommend holding your launch until we finish the intercept,“ the scientist replied. „I don't want my staff having to deal with two vehicles at once. Without worldwide tracking, we'll have to move fast once the American appears.“

„All right.“ Shen was reluctant to hold the launch, but agreed with Dong. He knew the staff's capabilities. „I'll wait for word from you.“

Dong reassured him, „Preparations for the booster have started and are on schedule. It should launch in ten minutes.“

Shen broke the connection and turned to find his launch crew suddenly busy at their posts. He should be worried about the American spacecraft, but felt relieved instead. He really hadn't expected them to launch so soon. It would have a short life.

**Space Force Battle Center, Miramar
0552**

Wrapped up in the launch sequence, Ray was almost irritated when Schultz's voice came over the comm circuit. „SITREP, people,“ Schultz announced.

Conversation stopped immediately, and the admiral continued, speaking quickly. „We’ve got a launch.“

The crew all looked at their displays, expecting to see a line over Gongga Shan. Ray cursed his luck. Intel had firmly assured him that they would be able to launch before the Chinese sent up another ASAT vehicle—maybe by less than an hour, but they needed that time to get into position.

Then Ray saw it was from Jinan, farther to the north. The thin red line grew slowly, angling east and steadily climbing in a graceful curve. He heard a controller announce, „It’s faster than a *T’ien Lung*.“

„A bigger gun?“ wondered Ray amazedly.

„No, that’s their manned space center,“ replied Barnes. „It has to be a standard booster. But what’s on top?“

„We can’t wait to figure that out,“ Schultz said. „We’ll continue with launch preparations while Intelligence tries to sort it out.“

It was less than five minutes later when Schultz interrupted their preparations again. With only a few minutes until ignition, Ray knew it would be important news.

„The launch was from their Jinan space complex, and the telemetry is consistent with a Long March 2F booster. That’s the vehicle they use for manned launches, but it’s moving too fast for a manned spacecraft. We think it has a much smaller payload.“

„Aimed at us, no doubt,“ Barnes remarked. „An orbital SAM.“

„Aimed at what they thought was us,“ Schultz replied. „That fireworks display was more useful than we thought.“

„With that much energy, they may still be able to engage us,“ Ray countered.

„And with what?“ asked Barnes.

„Probably another *T’ien Lung*,“ guessed Ray. „But it could be modified.“

„Nukes?“ Barnes didn’t look worried, but some of the other crew did.

„Anything’s possible.“

Schultz asked, „Are we go or no-go? We can hold on the pad.“

„With that thing waiting in orbit for us? No way,“ Ray responded. Suddenly he remembered he was out of line. Barnes should be the one answering. He looked at the major. „I recommend we go, sir.“

Biff nodded, then looked at the rest of the crew. All were silent, but they all nodded yes.

„They’re still aiming at something that isn’t there. Let’s go now, before they get a chance to regroup. We’re go,“ Biff answered firmly.

Gongga Shan

0605

General Shen had left the INN webcast on, in the hopes that some additional information might be added, but after running out of ways to repeat themselves, they’d just started speculating. While amusing, it wasn’t very useful.

He was in an unusual, in fact unique, situation. The projectile was ready, it had been for almost ten minutes, but they were not firing. Technicians sat idle, the gun crews crouched in their launch bunkers, and they waited. Xichuan was still waiting for *Defender* to appear on their tracking radars, while the interceptor raced to their best guess of its future position.

Shen found himself drawn to the INN show. Much of the material shown was coverage of the war. Most was propaganda, but the coverage was extensive. He learned a few things Beijing would certainly forbid them to discuss...

„FLASH. This is Mark Markin, in Miramar, California.“ Markin’s familiar image replaced the physics professor who had been explaining *Defender*’s engines.

„We are receiving many, many reports of a spacecraft launch from inside the Miramar Marine Corps Air Station.“ Markin looked and acted rattled and confused.

„Our reporters at the scene and numerous civilian sources have reported another launch just a few minutes ago. They described the noise as *shattering*, much, much louder than the event earlier this morning. What?“

Markin looked off to the side, then answered, „Good, put it up.“

„Here is an image of the launch taken by a local resident who grabbed his camera when he heard the noise.“ The picture showed a blue sky with an angled white pillar, almost a cone, across two-thirds of the frame. A small arrowhead sat on top of the pillar.

Markin’s voice said, „We’re going to enhance the picture.“ A box appeared around the arrowhead, and Shen watched as it expanded, then rippled, and finally sharpened. Individual pixels gave it a jagged look, but he could see swept-back wings, and make out clusters of flame at the base.

„Get me Dong!“ he shouted to the communications chief, then stared at the image on the screen. „Somebody print that out,“ he ordered, as the chief handed him a headset.

„Are you watching it, too? I don’t know what we saw earlier. This one looks real enough.“

Defender **0605**

The experience of the launch filled Ray’s senses. Every part of him inside and out was affected by the sound, which had faded, and by the acceleration that continued seemingly forever.

One far corner of Ray’s mind said something about „time dilation“, but the acceleration pushing him down was much more immediate. He found himself struggling to take a deep breath, although he’d been taught to take shallow breaths. The mask gave him all the oxygen he needed. There was nothing for him to do during the ascent, and he forced himself to relax, to accept the weight.

Biff watched the crew and hated the acceleration. The physical sensation was familiar to him, but his mind was filled with the responsibility he held. Mission commander. He tried to take comfort in his training as a combat pilot, but the

rules were different. All the rules. Not just movement, but sensors, and weapons as well. He'd drilled himself mercilessly in the simulators, never sure if it was enough. Now he'd find out. At least he didn't have to pull lead.

Ray focused on the board, letting his body do unconsciously what he couldn't tell it to. All the systems were working well, although they'd have to deploy the sensors to really check them out. They'd traded payload for time and overengineered the shock mountings. He had a feeling that would pay off.

Risking a small movement, he touched a switch on his jury-rigged hand controller and checked the tactical display. Two screens simultaneously displayed a side and overhead view of the situation. The Chinese intercept vehicle, marked TL1 on the display, was above them, but eastbound. They had launched to the north, into a polar orbit. Its high velocity would make it difficult, no, almost impossible, to attack *Defender*.

Gongga Shan 0610

General Shen knew that as well. And there were other problems. He pressed his point over the link to Xichuan. „If we try to intercept *Defender* on the next orbit, the *T'ien Lung* will be out of our view for over an hour. We can't tell what the Americans will do to it during that time.

„Instead, we should use it to kill another GPS satellite. Their orbits are fixed, and it's got plenty of energy for the intercept. I'll attack *Defender* with my weapon instead.“

„It's our last shot,“ Dong countered. „Shouldn't we use it to kill a GPS satellite? Two kills in one day, both while *Defender* is supposed to be protecting them, will be even a bigger embarrassment.“

Shen disagreed. „Better to destroy *Defender*. We may have missed with the Long March, but that doesn't change the value of the target.“

It was Shen's decision to make, but he wanted Dong to agree. His people would now have to handle the two vehicles, although only for a short time. Although he knew they could, the general asked, „Can you do it?“

„Yes,“ Dong admitted.

„Then tell them to prepare. We'll be firing in less than five minutes.“ He raised his voice for the last sentence, and the staff in the center hurried to obey.

„One more thing,“ General Shen added. „Tell Beijing we need to initiate the special attack.“ Shen lowered his voice without trying to sound conspiratorial. Security was so tight even his launch staff didn't know about it.

„Good,“ Dong answered, sounding relieved. „Liang has been after me to use it since the first launch this morning.“

Battle Center 0615

Jenny noticed it first. She ran the whole Center, but without communications, there was no Center. Consequently, she dedicated one of her displays to continuously monitoring the data links from dozens of other sites. These included command centers like NORAD and the NMCC, radar-tracking stations, and intelligence aircraft orbiting off the China coast. The Battle Center had no sensors of its own, but took the data from all these sources and created the global situation display.

The audio beep and the flashing red icon had her immediate attention. She called one of the controllers on her headset. „Carol, check on the link to Kwajalein. We’ve lost the signal.“

No sooner had the controller acknowledged her order than another link went red, this time the one to Pearl Harbor. Used to looking for patterns, she instantly compared the two, but could see no similarity. Pearl was a command site.

She started to detail another of her small staff to check out the link to Hawaii when a third one went red, this time in Ascension, and then others, coming so rapidly it was hard to count.

„Admiral, we’re losing all our sensors!“ Jenny tried to control the panic in her voice. She started to listen to Schultz’s reply when Carol cut in with a report on the Kwajalein tracking station.

„I’m in voice comms, Jenny. They say the gear’s fine, but they’re under electronic attack. Someone’s hacking their controller.“

„That’s impossible,“ Jenny exclaimed before realizing how silly that sounded. She paused, examining the situation, then suggested, „Their filters must be down. They’re supposed to reject anything that’s not encrypted.“

„They say this stuff is encrypted,“ Carol explained, „at least well enough to get through the filters.“

„We’ve got another launch,“ a different controller reported. „This time from Gongga Shan.“

Jenny saw the track appear on the globe and checked the sensor log. The detection had been made by an Air Force surveillance aircraft, one of several off the coast. So far they hadn’t been...

The globe, smoothly rotating in the center of the room, suddenly stopped, then moved jerkily before freezing again. What now?

Even as she switched her headset to the computer staff’s channel, Chris Brown, the head of the computer section, reported. „We’re being flooded. Someone’s sending bogus tracking data over the links.“

„The filter’s aren’t stopping it?“ Jenny asked.

„Not all of it.“

Jenny walked over to Brown’s console and watched him analyze the false information being sent from supposedly secure sites. „Here’s the header data on one that got through. It’s good.“

„They’re not all getting through the filters?“

„No, about one in ten makes it.“ He tapped his console, bringing up another stream of data. „This one has a similar header, but the encryption isn’t quite right, and it was rejected.“

„But the ones that do get through are enough,“ he continued. „They force our system to chew on each for a while before rejecting it, and for every real packet, we’re getting dozens of these fakes.“

„Jenny, I need to know what’s happening.“ Admiral Schultz’s voice in her headset was soft, but insistent. She looked across the open space at the admiral, who met her gaze expectantly.

„We’re under electronic attack, sir, through our tracking stations. It’s sophisticated. They not only deny us sensor information, but they’re piggybacking bad data on the links to bog us down.“

„How do we block it?“

She sighed. „I’ll have to get back to you, sir.“

Chris Brown had been listening to her conversation with the admiral, and spoke as soon as she signed off. „It’s completely down now. We just lost sensor processing.“

Defender **0620**

They were still setting up when Jenny called. The pilots, Scarelli and Skeldon, had opened the bay doors, then Andre Baker, the weapons officer, extended the laser turret above the bay. While the specialists readied their gear, Ray watched power levels and the health of the data link.

He’d noticed the problems a few minutes earlier, but had concentrated on the systems at his end. The thought of the Battle Center going down left him feeling very alone.

Her message clarified the situation but didn’t help solve it. „Ray, we’ve lost sensors. We’re under attack down here.“ Her words chilled him, but he forced himself to be silent, to listen. She explained the problem, but its effects were obvious. They were on their own. She could not say when they’d be back on-line.

Suddenly Ray felt vulnerable. Somewhere below, another *T’ien Lung* was climbing toward them.

Biff Barnes looked at the display screens. They were flat and two-dimensional, nothing like the Battle Center’s fancy displays. He selected different modes, looking at projected paths and engagement envelopes.

He ignored the new threat, somewhere below them. They could do nothing about it, so he’d decided to work on the one target they did have.

Ray looked over at Barnes studying the display. „They’ve missed their chance at us. They’ll have to go for a satellite.“

„I agree,“ Biff responded. „Look at this.“ He sent the plot to Ray’s console. It showed the remaining GPS satellite tracks and the area covered by the Chinese tracking radars.

„The easiest one to reach is number eighteen, here.“ He highlighted one of the satellites. „If they make a course change anytime in the next half hour, they can nail it. They’ll be able to watch the intercept, as well.“

Barnes waited half a moment while McConnell studied the screen. Ray nodded slowly. „All right,“ the engineer replied. It was almost a question.

„We’re taking it out,“ Biff stated. „Right now. Before it gets any farther away. Before TL2 shows up to ruin our morning. Pilot, align us on TL1. Crew, engage TL1.“

Ray watched the stars and the earth spin slowly as Scarelli oriented the open bay so it faced toward the Chinese spacecraft. The distance was a problem, but at least they didn’t have to maneuver to keep the target in *Defender’s* limited sensor arc.

Sue Tillman, the sensor officer, went from busy to extremely busy. She fiddled with the radar settings, then chose one of a number of search patterns for the radar to follow. Everything had to be done manually, and that took time.

The lieutenant finally reported, „I’ve got a hit with the radar, 151 miles, 330 relative, 80 degrees elevation. Changing to track mode.“ A few moments later, she said, „Track established.“

Checking another display, she reported, „IR confirms.“

Ray suppressed the urge to comment on the gear actually working.

By rights, the detection should have been automatically tracked and evaluated. But systems integration takes valuable design time. Instead, it was all done manually, and with each second the target moved farther away.

Captain Baker, the weapons officer, didn’t miss a beat. He’d slaved the laser to the data sent by the Tillman’s radar. „Ready,“ he reported, as calmly as if he reporting the weather.

Ray had seen the seven-ton laser turret tested on the ground. The motors made an unholy whine. Now, there was no sound, just a slight vibration felt through the ship’s structure, as it tracked the target.

„It’s at the edge of our envelope,“ Ray reminded the major.

„And I figured out what that envelope was. Shoot six shots.“

Ray felt more thuds and vibrations as pumps pushed chemicals into a combustion chamber. The intense flash of their ignition „pumped“ the chemical laser and a two-megawatt beam angled out and away.

Inside *Defender*, Ray watched five seconds come and go. Sue Tillman, looking disappointed, turned to look over Captain Baker.

The weapons officer watched a spectrograph slaved to the laser mirror.

„Nothing,“ he reported.

Set for five shots, the laser automatically fired again. McConnell watched a TV camera set to cover the bay. Puffs of vapor left the combustion chamber, and he could see the turret slowly moving, but it was a silent combat.

Both Baker and Tillman spoke this time. The army officer announced triumphantly, „I’ve got an aluminum line.“ The laser had caused part of the target to glow. Baker’s spectrograph had seen that light, and told him what that part was made of.

Tillman confirmed, „IR’s up now. It’s a lot hotter than before.“

„But it’s still there on radar?“ Barnes asked.

She nodded. „Trajectory’s unchanged.“

„Continue firing.“

The third shot, five seconds of intense energy, also struck the Chinese vehicle, but with no better result than before. Ray fought the urge to fiddle with the

systems display, or remind Barnes that the target was growing more distant with every shot.

They'd spent a lot of time trying to decide how they would know when they'd actually „killed“ a target. You couldn't shoot down something in space, and at these distances they couldn't see the effects of their attacks.

During the fourth shot, Biff asked, „Sue, can you measure the temperature rise?“

„No, sir. The equipment's resolution isn't that fine. Physics says it can't radiate heat away as fast as we're adding it, but we're also adding less heat with each shot, because of the increasing distance.“

By the time she answered Barnes's question, the fifth shot of the salvo had been fired as well. They'd used up almost half the magazine, but the mission commander didn't wait a moment. „Keep firing. Another five.“

Well, we're here to shoot down satellites, Ray thought. He tried to stay focused on his monitors, watching for signs of trouble. It would be hell if a mechanical failure interfered at this point.

Tillman saw it first, on the second shot of the new salvo. „IR's showing a big heat increase!“

„Spectrograph's full of lines!“ Baker reported triumphantly. „I've got silicon, nitrogen...“

„Kill the laser!“ Biff ordered. „Silicon means the electronics, and nitrogen's either solid propellant or the explosive warhead.“

„There's also hydrogen and plutonium,“ she added, her voice a little unsteady.

Barnes nodded as if he'd expected it. „They were gunning for us.“

„Multiple contacts. Radar shows debris as well,“ Tillman confirmed. *Defender's* millimeter-wave radar would have no trouble distinguishing individual pieces of wreckage.

„It's a kill,“ she said with satisfaction. Sue Tillman also handled voice comms with Miramar, and said „They're cheering in the Battle Center!“

Ray noted the time. They'd been up half an hour.

Gongga Shan 0635

„It's gone, sir!“ The communications tech handed him the headset. Shen listened to Dong's report quietly. The Americans had destroyed the special *T'ien Lung*. They'd made the kill at long range, on an opening target. *Defender* was more than capable.

Shen worked to control his surprise and disappointment, making his face a mask. *Defender* had proved itself. Now more than before, it was vital that the second vehicle destroy the American spacecraft. Unfortunately, there was nothing more he could do to ensure its success. Like countless commanders before him, Shen could only wait for the dice to stop rolling.

Battle Center

0635

„It’s a brute force attack, Jenny.“ Chris Brown sat surrounded by display screens. Some showed packets of invading data. Others listed tables of statistical data—numbers of packets sent from each site, numbers rejected by the filter, amount of processor time lost, and many other values.

„They don’t have our encryption completely broken, but they’ve learned enough to get through occasionally. See,“ he said, pointing to two invading data packets. „The body of the message is the same. And most of the header data is valid. All they have to do is vary the part they don’t know.

„And they’re getting better at it. Look at this curve.“ It showed the percentage of successful penetrations since the attack began, and the number steadily increased.

Jenny forced herself to think clearly, to ignore the rest of the center and the craft in space above her. This was a battle of minds.

„The encryption key is time-based,“ Jenny said. „To mimic it at all, they’d have to be monitoring our communications in real time.“

„Then that’s what they’re doing,“ replied the computer analyst. „All of the communications are hardened land lines.“ Jenny had insisted on that, for obvious reasons.

„Except the signal to *Defender*,“ countered Brown.

„Which we have to leave up,“ finished Jenny. That link was the reason for the Battle Center’s existence. She visualized the flow, out from the Center, picked up by intercept antenna somewhere, then fed back into the system through pirated computers. The Chinese were using their own codes against them.

„Chris, we have to change the encryption schemes.“

„That won’t help, they’ll only...“

„Only for the link to *Defender*,“ she continued. „Right now we all use the same coding scheme. Change the time-based key for *Defender*’s link, and the filters will reject it automatically.“

Brown’s face lit up. „Yeah, I can even optimize the coding to make it easier for the filters to spot. I can use a modifier...“

The analyst trailed off into thought, but quickly resurfaced. „I’ll have to upload a patch to *Defender*, but the Chinese haven’t interfered with the link. I can have us up in five minutes.“

Jenny hurried back to her own console, keying her handset as she went. „Good news, Admiral.“

Defender

0645

Brown’s patch had an immediate effect. Cut off from the ground, the computer had been displaying the estimated position of the second *T’ien Lung*. It had been close, but the uncertainty of the estimate had prevented them from taking any action.

Now, within moments, the display flashed with the real position of TL2. A red arc showed its track history, a red dot its present location, and a red cone its possible future position. *Defender's* orbit lay square in the center of that cone, and another flashing symbol showed the intercept point.

Intercept was only five minutes away. They couldn't hope to set up and kill it before it reached them. Barnes ordered „Countermeasures!“ and then told the pilots, „Take this vector. Pull in the turret, close the doors.“

Ray saw the stars swing again, then felt pressure against his back as *Defender's* engines came to life. They quickly increased to full power. The rest of the crew quickly carried out Barnes's orders, bringing the laser turret inside.

The doors might protect the turret against small fragments from the *T'ien Lung* if it did detonate. Of course, with the doors closed, they were blind as well as defenseless. More than ever, Ray felt grateful for the data link.

Scarelli had oriented the craft so that its top side faced the *T'ien Lung*. They'd argued about it during one of the many strategy sessions, and decided they'd rather have fragments in the doors and upper fuselage than in the heat shield. They could live without weapons and sensors, but they couldn't reenter without the heat shield.

The acceleration wasn't as bad as takeoff, but it was still intense, and mixed with uncertainty.

His board showed the same tracks as Barnes's, as well as other ship's systems. He watched the radar decoys leave the ship, a cluster of simple radar corners, based on their best guesses about the design of the kill vehicle's sensors.

McConnell also watched as the line of *Defender's* orbit slowly curved. The engines stopped, and Ray saw that they were just outside the Chinese intercept cone.

The arc carrying the *T'ien Lung* did not change for two long minutes. It finally started to shift, back toward an intercept on their new course. „Look at that,“ Barnes said, pointing to the display. „Their reaction times are very slow.“

He waited for a moment, then announced, „They're not buying the decoys. All right, pilot, now take this vector. Stand by for a long burn, people.“

This time Ray was ready for the acceleration, and better still, welcomed it. The Chinese lag in controlling the *T'ien Lung* would be their undoing.

Barnes's new course zigged *Defender* away from the *T'ien Lung*, exactly opposite to the course correction the Chinese vehicle was making. *Defender's* engines were more powerful than the *T'ien Lung's* thrusters. The Chinese vehicle had been designed to engage satellites, not maneuverable spacecraft.

„Past closest point of approach!“ the copilot reported. Skeldon didn't sound relieved. The Chinese could always command-detonate the warhead if they felt there was a chance of damaging them.

They did, after another thirty extra seconds of distance. There was no sound of explosion, but two sharp bangs, like rifle shots, sounded over their heads, and part of Ray's board went from green to red and yellow. One corner of his eye noted that the symbol for the second *T'ien Lung* was now gone from the screen.

Ray reported, „We're losing hydrogen pressure. One of the tanks has been holed!“

„Continue the burn,“ Barnes ordered. „Move as much hydrogen out of the tank as you can before it escapes.“

„Doing it,“ Ray responded. „It’ll screw up our center of gravity,“ he warned.

„Compensating,“ responded Scarelli. „What about that other strike?“ the pilot asked.

„That’ll take a little sorting out,“ Ray replied.

Part of the electrical system flashed red, but what was the problem? Was it a component, or the wiring? They’d installed redundant lines on the critical systems. It was time to see if it was working. He started isolating components. His mind focused on the technical problem, he hardly noticed the acceleration.

There. „Primary actuators for the ailerons are offline. Backups seem all right.“ But something else aft still glowed red. He closed a few more systems, but the news wasn’t good. „We’ve lost number three hydrogen pump.“

„Which means no number three engine,“ Scarelli continued.

„We can cope,“ Barnes reassured him. „We don’t have another burn until we reenter.“

The burn finished, and Ray was surprised by the sudden weightlessness. His stomach complained a little, but he mastered it.

Barnes asked. „Jim, how long until we’re over Xichuan?“

Scarelli checked his plot, then answered, „Twenty-three minutes. That last burn brought our orbit right over them!“ He looked at Barnes with a „How’d you do that?“ expression.

The major grinned. „I picked the first burn vector directly away from where I wanted us to end up. That way I could make the long burn in the right direction. Set up for ground attack. Here are the targets.“

Ray watched as he designated two points on the map display. Scarelli had to make one small burn to refine the course, then he and Skeldon turned *Defender* so her bay faced the globe of earth below.

After that, they waited. Baker and Tillman checked out their equipment, and pilots monitored their course. For the first time since they had taken off, Ray had a moment to realize he was in space.

His stomach was still under control, and they were all strapped in anyway. No floating during General Quarters, he mused. He looked at the monitors, one of which showed the earth „above“ them. They were over the North Pole, coming down on the other side of the world from California. It seemed different, somehow. Smaller, and more vulnerable.

„Five minutes,“ Scarelli warned, and Baker and Tillman both acknowledged. Ray and Barnes both watched silently as the specialists worked. Tillman reported „Imaging first target,“ and activated her radar. The millimeter-wave signal easily found the Xichuan space center, a cluster of large buildings. Ray selected the radar display, and studied the buildings. They’d seen it before in satellite photographs, and he quickly picked out the administration buildings, the control center, the powerhouse, and the other structures. The image was clear enough to show the chain-link fence that surrounded the compound.

Baker designated his rods, and Ray saw three small symbols appear over the control center, and two more on the antennas. „Ready for drop,“ he reported.

„Drop on the mark,“ Barnes ordered calmly.

„Roger, in ten,“ the weapons officer replied, and then counted the seconds down. „Dropping now.“

Ray saw his board change but felt nothing.

The rods were not as noisy or complex as the laser. Each simply consisted of a long, pointed tungsten cylinder weighing fifty kilograms, with a small motor and finned guidance unit on the back. Springs ejected them in quick sequence from their rack in *Defender's* bay, and McConnell watched the stream drift clear of the ship.

As fast as the rods had been ejected, their individual motors fired, driving them down toward the earth and reentry. The tungsten projectile would easily withstand the heat, and was aerodynamically shaped. The guidance unit would burn up, but by then they'd be aligned on their target, and with so much speed that nothing would deflect them.

Xichuan was still several hundred miles ahead of them, but of course the rods needed that time to cover the distance to the ground. It also made it difficult for the Chinese to predict where the attack would strike. If they could even see *Defender*. The ship was approaching from the north, where Chinese radar coverage was limited.

„Five minutes to next target,“ Baker announced.

Gongga Shan 0720

The call came over a standard phone line, not the command net. General Shen Xuesen took the receiver from the communications chief.

„General, this is Wu Lixin.“ Shen knew the man. He was one of Dong's assistants at the control center. He sounded absolutely shattered.

„Wu, what's happened?“

„They bombed us, sir. Dong is dead, and so are most of the staff. The center's gone, ripped apart.“

„Bombs. Was it an air attack?“

„No, no airplane, nothing was seen. No planes, no missiles.“

The general felt his heart turn to ice. It had to be *Defender*. So the detonation hadn't hurt them at all. They were still capable.

Shen looked at their predicted orbit. She was moving from north to south, and...

„Out! Everybody outside right now! Head for the shelters!“ he turned to the comm chief. „Get the gun crews out as well.“ Theoretically, the gun and the control bunkers were hardened, but Xichuan's control center had been hardened as well.

There was no way to tell when, or even if, an attack would happen, but Shen wasn't risking his people's lives. The instant he saw everyone in the center moving, he headed for the door himself.

He sprinted outside, intending to head for one of the slit trenches that had been dug nearby, but he had made it no more than a dozen steps before the explosions started.

It wasn't from behind him, but from the mountain, to his right. He turned just a little and saw a series of bright yellow explosions ripple over the gun's location.

Earth spouted into the air hundreds of feet, and he could feel the concussions from over a kilometer away.

At least three deadly flowers blossomed at the base of the gun, right over the breech. Another four or five landed in a neat line on top of the barrel, and another three clustered closely around the muzzle. In the darkness, the mountain was outlined for several seconds by the flash from the explosions.

One of the first group must have found the liquid-propellant piping, because the entire building suddenly disintegrated in a ball of orange flame. Pieces of debris arced high into the air, and Shen suddenly found himself running again, diving headfirst into the trench as pieces of cement, steel, and rock began raining down on him.

The deadly rain stopped, and Shen untangled himself from the others who had sought shelter with him in the trench. Reluctantly, he knelt, and then stood, a little unsteadily. Knowing and hating what he would see, he nonetheless had to find out what they'd done to his gun.

The breech building was gone, replaced by a crater filled with flaming debris. Most of the installation had been below ground, and the crater had carved a massive gouge out of the mountain's roots.

The slope of the mountain looked almost untouched, but a line of craters neatly followed the path of the gun barrel, and the mouth was hidden in a mound of loose rock.

Five years of work. Ten years of convincing. Twenty years of dreaming, all lost. His friend Dong was dead, with many of China's brightest dead with him. How many bodies would they find just in the ruins below?

Shen realized others were trying to help him out of the trench. Passively, he let them lift him out and steady him on the grass. He turned automatically to head for the center, and saw it was in ruins, flames outlining the ruined walls. He hadn't even heard the explosions.

It was finished. Shen was suddenly very sorry he'd lived.

Defender

With most of their fuel used up, they'd made one small burn to line up for reentry after two more orbits. With nothing to do but wait, Ray felt his sensation of unreality return. His mind and emotions sought to understand this new experience.

They'd fought and won a battle in space. He'd played a role, a major one, in making it happen, but he knew he wasn't the only one. More importantly, others would follow after him. Not all would be Americans, maybe not all of them would be friends, but warfare had changed, as it always does.

Biff Barnes checked the displays over and over again, looking for the smallest fault, but the ship was performing well. Reentry was now only a few minutes away. Scarelli and Skeldon were handling the preparations perfectly.

For some reason Barnes was having problems trying to determine how he would fill out his personal flight log. Would the *T'ien Lung*s count as „kills“? Three more

to become an „orbital ace“? He suspected there would be more missions after this one.

That thought led to another, and he started to make a mental list of improvements *Defender* would need before she flew again.

Battle Center

Jenny Oh fought hard to keep her emotions under control. Her first cheer, when *Defender* had destroyed the first *T'ien Lung*, had been followed by another when they'd escaped the second kill vehicle. Her heart had leapt to her throat when she saw the symbols for *Defender* and the kill vehicle merge, and then soared when they'd said all were safe.

And that had been followed by the destruction of the Dragon Gun at Gongga Shan. They'd watched it all on *Defender's* imaging radar, data-linked down to the Center. The sudden transformation of the neat structural shapes to rubble had been unmistakable, and she'd yelled as loud as any of them. It was the success of everything they'd worked so hard for. *Defender* had proven herself.

Jenny had looked over at Admiral Schultz, who sat quietly, his head in his hands. He stayed that way, aware but silent, for some time. After the celebration stopped, he'd left, then come back later, in time to watch the reentry. He slowly walked over to Jenny's station, checking his watch as he approached.

„Check INN,“ the admiral suggested, smiling. It was just 1600.

Jenny selected to broadcast, and saw Markin's now-familiar face. Behind him was a commercial satellite image of the destroyed gun. Markin was excited, almost frantic.

„Flash! Only a short time ago sources revealed the destruction of the Gongga Shan Dragon Gun by *Defender*, and also the destruction of two orbital kill vehicles. The Chinese attempted to use these to shoot down the American spacecraft and a GPS satellite, but according to my source, both weapons were destroyed after an extended battle.“

„Extended battle?“ Jenny wondered aloud.

„Well, it was extended in orbital terms.“ The Admiral's smile widened.

„You're his source?“ Jenny asked, almost shouting, and then controlling her voice.

„This time, yes. I felt bad about bamboozling him earlier this morning. There's no more need for secrecy, and I figured the best way for the media to get it straight was to get it straight from me.“

They watched Markin's piece together for a few more minutes, as he detailed the engagements in space and the damage to the Chinese. Finally, he started to repeat himself, and Jenny checked the status board. *Defender* was now blacked out, and would be until she finished reentry.

The admiral watched her for a moment, then said, „Congratulations, Jenny. You made it happen.“

„Congratulations to all of us, Admiral. We all did it.“

„We all believed we could make it work, Jenny, and worked our tails off to prove it to the rest of the world. But you and Chris Brown saved the mission. Chris is a

civilian, and he'll get a commendation for his civil service file. I'm recommending you for the Navy Cross. Nobody fired a shot in your direction, but you were in the fight as much as anyone. Your quick thinking saved lives, and won a battle."

Jenny felt herself flush, and she automatically came to attention. "Thank you, sir!" Then she wavered. "But what about *Defender*..."

Schultz waved a hand, cutting off her protests. "Oh, yes, there'll be medals and parades and all the glory a grateful nation can provide. They've earned all of it."

"Do you think Ray will be able to get a little free time?" she asked quietly.

