THE ETHICAL EQUATIONS

It is very, very queer. The Ethical Equations, of course, link conduct with probability, and give mathematical proof that certain patterns of conduct increase the probability of certain kinds of coincidences. But nobody ever expected them to have any really practical effect. Elucidation of the laws of chance did not stop gambling, though it did make life insurance practical. The Ethical Equations weren't expected to be even as useful as that. They were just theories, which seemed unlikely to affect anybody particularly. They were complicated, for one thing. They admitted that the ideal pattern of conduct for one man wasn't the best for another. A politician, for example, has an entirely different code—and properly—than a Space Patrol man. But still, on at least one occasion—

The thing from outer space was fifteen hundred feet long, and upward of a hundred and fifty feet through at its middle section, and well over two hundred in a curious bulge like a fish's head at its bow. There were odd, gill-like flaps just back of that bulge, too, and the whole thing looked extraordinarily like a monster, eyeless fish, floating in empty space out beyond Jupiter. But it had drifted in from somewhere beyond the sun's gravitational field—its speed was too great for it to have a closed orbit—and it swung with a slow, inane, purposeless motion about some axis it had established within itself.

The little spacecruiser edged closer and closer. Freddy Holmes had been a pariah on the *Arnina* all the way out from Mars, but he clenched his hands and forgot his misery and the ruin of his career in the excitement of looking at the thing.

"No response to signals on any frequency, sir," said the communications officer, formally. "It is not radiating. It has a minute magnetic field. Its surface temperature is just about four degrees absolute."

The commander of the *Arnina* said, "Hrrrmph!" Then he said, "We'll lay alongside." Then he looked at Freddy Holmes and stiffened. "No," he said, "I believe you take over now, Mr. Holmes."

Freddy started. He was in a very bad spot, but his excitement had made him oblivious of it for a moment. The undisguised hostility with which he was regarded by the skipper and the others on the bridge brought it back, however.

"You take over, Mr. Holmes," repeated the skipper bitterly. "I have orders to that effect. You originally detected this object and your uncle asked Headquarters that you be given full authority to investigate it. You have that authority. Now, what are you going to do with it?"

There was fury in his voice surpassing even the rasping dislike of the voyage out. He was a lieutenant commander and he had been instructed to take orders from a junior officer. That was bad enough. But this was humanity's first contact with an extrasolar civilization, and Freddy Holmes, lieutenant junior grade, had been given charge of the matter by pure political pull.

Freddy swallowed.

"I . . . I—" He swallowed again and said miserably, "Sir, I've tried to explain that I dislike the present set-up as much as you possibly can. I . . . wish that you would let me put myself under your orders, sir, instead of—"

"No!" rasped the commander vengefully. "You are in command, Mr. Holmes. Your uncle put on political pressure to arrange it. My orders are to carry out your instructions, not to wet-nurse you if the job is too big for you to handle. This is in your lap! Will you issue orders?"

Freddy stiffened.

"Very well, sir. It's plainly a ship and apparently a derelict. No crew would come in without using a drive, or allow their ship to swing about aimlessly. You will maintain your present position with relation to it. I'll take a spaceboat and a volunteer, if you will find me one, and look it over."

He turned and left the bridge. Two minutes later he was struggling into a spacesuit when Lieutenant Bridges—also junior grade—came briskly into the spacesuit locker and observed:

"I've permission to go with you, Mr. Holmes." He began to get into another spacesuit. As he pulled it up over his chest he added blithely: "I'd say this was worth the price of admission!"

Freddy did not answer. Three minutes later the little spaceboat pulled out from the side of the cruiser. Designed for expeditionary work and tool-carrying rather than as an escapecraft, it was not inclosed. It would carry men in spacesuits, with their tools and weapons, and they could breathe from its tanks instead of from their suits, and use its power and so conserve their own. But it was a strange feeling to sit within its spidery outline and see the great blank sides of the strange object draw near. When the spaceboat actually touched the vast metal wall it seemed impossible, like the approach to some sorcerer's castle across a monstrous moat of stars.

It was real enough, though. The felted rollers touched, and Bridges grunted in satisfaction.

"Magnetic. We can anchor to it. Now what?"

"We hunt for an entrance port," said Freddy curtly. He added: "Those openings that look like gills are the drive tubes. Their drive's in front instead of the rear. Apparently they don't use gyros for steering."

The tiny craft clung to the giant's skin, like a fly on a stranded whale. It moved slowly to the top of the rounded body, and over it, and down on the other side. Presently the cruiser came in sight again as it came up the near side once more.

"Nary a port, sir," said Bridges blithely. "Do we cut our way in?"

"Hm-m-m," said Freddy slowly. "We have our drive in the rear, and our control room in front. So we take on supplies amidships, and that's where we looked. But this ship is driven from the front. Its control room might be amidships. If so, it might load at the stern. Let's see."

The little craft crawled to the stern of the monster.

"There!" said Freddy.

It was not like an entrance port on any vessel in the solar system. It slid aside, without hinges. There was an inner door, but it opened just as readily. There was no rush of air, and it was hard to tell if it was intended as an air lock or not.

"Air's gone," said Freddy. "It's a derelict, all right. You might bring a blaster, but what we'll mostly need is light, I think."

The magnetic anchors took hold. The metal grip shoes of the spacesuits made loud noises inside the suits as the two of them pushed their way into the interior of the ship. The spacecruiser had been able to watch them, until now. Now they were gone.

The giant, enigmatic object which was so much like a blind fish in empty space floated on. It swung aimlessly about some inner axis. The thin sunlight, out here beyond Jupiter, smote upon it harshly. It seemed to hang motionless in mid-space against an all-surrounding background of distant and unwinking stars. The trim Space Patrol ship hung alertly a mile and a half away. Nothing seemed to happen at all.

Freddy was rather pale when he went back to the bridge. The pressure mark on his forehead from the spacesuit helmet was still visible, and he rubbed at it abstractedly. The skipper regarded him with a sort of envious bitterness. After all, any human would envy any other who had set foot in an alien spaceship. Lieutenant Bridges followed him. For an instant there were no words. Then Bridges saluted briskly:

"Reporting back on board, sir, and returning to watch duty after permitted volunteer activity."

The skipper touched his hat sourly. Bridges departed with crisp precision. The skipper regarded Freddy with the helpless fury of a senior officer who has been ordered to prove a junior officer a fool, and who has seen the assignment blow up in his face and that of the superior officers who ordered it. It was an enraging situation. Freddy Holmes, newly commissioned and assigned to the detector station on Luna which keeps track of asteroids and meteor streams, had

discovered a small object coming in over Neptune. Its speed was too high for it to be a regular member of the solar system, so he'd reported it as a visitor and suggested immediate examination. But junior officers are not supposed to make discoveries. It violates tradition, which is a sort of Ethical Equation in the Space Patrol. So Freddy was slapped down for his presumption. And he slapped back, on account of the Ethical Equations' bearing upon scientific discoveries. The first known object to come from beyond the stars ought to be examined. Definitely. So, most unprofessionally for a Space Patrol junior, Freddy raised a stink.

The present state of affairs was the result. He had an uncle who was a prominent politician. That uncle went before the Space Patrol Board and pointed out smoothly that his nephew's discovery was important. He demonstrated with mathematical precision that the Patrol was being ridiculous in ignoring a significant discovery simply because a junior officer had made it. And the Board, seething at outside interference, ordered Freddy to be taken to the object he had detected, given absolute command of the spacecruiser which had taken him there, and directed to make the examination he had suggested. By all the laws of probability, he would have to report that the hunk of matter from beyond the solar system was just like hunks of matter in it. And then the Board would pin back both his and his uncle's ears with a vengeance.

But now the hunk of matter turned out to be a fish-shaped artifact from an alien civilization. It turned out to be important. So the situation was one to make anybody steeped in Patrol tradition grind his teeth.

"The thing, sir," said Freddy evenly, "is a spaceship. It is driven by atomic engines shooting blasts sternward from somewhere near the bow. Apparently they steer only by hand. Apparently, too, there was a blow-up in the engine room and they lost most of their fuel out the tube vents. After that, the ship was helpless though they patched up the engines after a fashion. It is possible to calculate that in its practically free fall to the sun it's been in its present state for a couple of thousand years."

"I take it, then," said the skipper with fine irony, "that there are no survivors of the crew."

"It presents several problems, sir," said Freddy evenly, "and that's one of them." He was rather pale. "The ship is empty of air, but her tanks are full. Storage spaces containing what look like supplies are only partly emptied. The crew did not starve or suffocate. The ship simply lost most of her fuel. So it looks like they prepared the ship to endure an indefinite amount of floating about in free space and"—he hesitated—"then it looks like they went into suspended animation. They're all on board, in transparent cases that have—machinery attached. Maybe they thought they'd be picked up by sister ships sooner or later."

The skipper blinked.

"Suspended animation? They're alive?" Then he said sharply: "What sort of ship is it? Cargo?"

"No, sir." said Freddy. "That's another problem. Bridges and I agree that it's a fighting ship, sir. There are rows of generators serving things that could only be weapons. By the way they're braced, there are tractor beams and pressor beams

and—there are vacuum tubes that have grids but apparently work with cold cathodes. By the size of the cables that lead to them, those tubes handle amperages up in the thousands. You can figure that one out, sir."

The skipper paced two steps this way, and two steps that. The thing was stupendous. But his instructions were precise.

"I'm under your orders," he said doggedly. "What are you going to do?"

"I'm going to work myself to death, I suppose," said Freddy unhappily, "and some other men with me. I want to go over that ship backwards, forwards, and sideways with scanners, and everything the scanners see photographed back on board, here. I want men to work the scanners and technicians on board to direct them for their specialties. I want to get every rivet and coil in that whole ship on film before touching anything."

The skipper said grudgingly:

"That's not too foolish. Very well, Mr. Holmes, it will be done."

"Thank you," said Freddy. He started to leave the bridge, and stopped. "The men to handle the scanners," he added, "ought to be rather carefully picked. Imaginative men wouldn't do. The crew of that ship—they look horribly alive, and they aren't pretty. And . . . er . . . the plastic cases they're in are arranged to open from inside. That's another problem still, sir."

He went on down. The skipper clasped his hands behind his back and began to pace the bridge furiously. The first object from beyond the stars was a spaceship. It had weapons the Patrol had only vainly imagined. And he, a two-and-a-half-striper, had to stand by and take orders for its investigation from a lieutenant junior grade just out of the Academy. Because of politics! The skipper ground his teeth—

Then Freddy's last comment suddenly had meaning. The plastic cases in which the alien's crew lay in suspended animation opened from the inside. From the inside!

Cold sweat came out on the skipper's forehead as he realized the implication. Tractor and pressor beams, and the ship's fuel not quite gone, and the suspended-animation cases opening from the inside—

There was a slender coaxial cable connecting the two spacecraft, now. They drifted in sunward together. The little cruiser was dwarfed by the alien giant.

The sun was very far away; brighter than any star, to be sure, and pouring out a fierce radiation, but still very far from a warming orb. All about were the small, illimitably distant lights which were stars. There was exactly one object in view which had an appreciable diameter. That was Jupiter, a new moon in shape, twenty million miles sunward and eighty million miles farther along its orbit. The rest was emptiness.

The spidery little spaceboat slid along the cable between the two craft. Spacesuited figures got out and clumped on magnetic-soled shoes to the air lock. They went in.

Freddy came to the bridge. The skipper said hoarsely:

"Mr. Holmes, I would like to make a request. You are, by orders of the Board, in command of this ship until your investigation of the ship yonder is completed."

Freddy's face was haggard and worn. He said abstractedly:

"Yes, sir. What is it?"

"I would like," said the *Arnina*'s skipper urgently, "to send a complete report of your investigation so far. Since you are in command, I cannot do so without your permission."

"I would rather you didn't, sir," said Freddy. Tired as he was, his jaws clamped. "Frankly, sir, I think they'd cancel your present orders and issue others entirely."

The skipper bit his lip. That was the idea. The scanners had sent back complete images of almost everything in the other ship, now. Everything was recorded on film. The skipper had seen the monsters which were the crew of the extrasolar vessel. And the plastic cases in which they had slumbered for at least two thousand years did open from the inside. That was what bothered him. They did open from the inside!

The electronics technicians of the *Arnina* were going about in stilly rapture, drawing diagrams for each other and contemplating the results with dazed appreciation. The gunnery officer was making scale, detailed design-drawings for weapons he had never hoped for, and waking up of nights to feel for those drawings and be sure that they were real. But the engineer officer was wringing his hands. He wanted to take the other ship's engines apart. They were so enormously smaller than the *Arnina*'s drive, and yet they had driven a ship with eighty-four times the *Arnina*'s mass—and he could not see how they could work.

The alien ship was ten thousand years ahead of the *Arnina.* Its secrets were being funneled over to the little Earth-ship at a rapid rate. But the cases holding its still-living crew opened from the inside.

"Nevertheless, Mr. Holmes," the skipper said feverishly, "I must ask permission to send that report."

"But I am in command," said Freddy tiredly, "and I intend to stay in command. I will give you a written order forbidding you to make a report, sir. Disobedience will be mutiny."

The skipper grew almost purple.

"Do you realize," he demanded savagely, "that if the crew of that ship is in suspended animation, and if their coffins or containers open only from inside—do you realize that they expect to open them themselves?"

"Yes, sir," said Freddy wearily. "Of course. Why not?"

"Do you realize that cables from those containers lead to thermobatteries in the ship's outer plating? The monsters knew they couldn't survive without power, but they knew that in any other solar system they could get it! So they made sure they'd pass close to our sun with what power they dared use, and went into suspended animation with a reserve of power to land on and thermobatteries that would waken them when it was time to set to work!"

"Yes, sir," said Freddy, as wearily as before. "They had courage, at any rate. But what would you do about that?"

"I'd report it to Headquarters!" raged the skipper. "I'd report that this is a warship capable of blasting the whole Patrol out of the ether and smashing our planets! I'd say it was manned by monsters now fortunately helpless, but with fuel enough to maneuver to a landing. And I'd ask authority to take their coffins out of their ship and destroy them! Then I'd—"

"I did something simpler," said Freddy. "I disconnected the thermobatteries. They can't revive. So I'm going to get a few hours' sleep. If you'll excuse me—"

He went to his own cabin and threw himself on his bunk.

Men with scanners continued to examine every square inch of the monster derelict. They worked in spacesuits. To have filled the giant hull with air would practically have emptied the *Arnina*'s tanks. A spacesuited man held a scanner before a curious roll of flexible substance, on which were inscribed symbols. His headphones brought instructions from the photo room. A record of some sort was being duplicated by photography. There were scanners at work in the storerooms, the crew's quarters, the gun mounts. So far no single article had been moved from the giant stranger. That was Freddy's order. Every possible bit of information was being extracted from every possible object, but nothing had been taken away. Even chemical analysis was being done by scanner, using cold-light spectrography applied from the laboratory on the cruiser.

And Freddy's unpopularity had not lessened. The engineer officer cursed him luridly. The stranger's engines, now—they had been patched up after an explosion, and they were tantalizingly suggestive. But their working was unfathomable. The engineer officer wanted to get his hands on them. The physiochemical officer wanted to do some analysis with his own hands, instead of by cold-light spectrography over a scanner. And every man, from the lowest enlisted apprentice to the skipper himself, wanted to get hold of some artifact made by an alien, non-human race ten thousand years ahead of human civilization. So Freddy was unpopular.

But that was only part of his unhappiness. He felt that he had acted improperly. The Ethical Equations gave mathematical proof that probabilities and ethics are interlinked, so that final admirable results cannot be expected from unethical beginnings. Freddy had violated discipline—which is one sort of ethics—and after that through his uncle had interjected politics into Patrol affairs. Which was definitely a crime. By the Equations, the probability of disastrous coincidences was going to be enormous until corrective, ethically proper action was taken to cancel out the original crimes. And Freddy had been unable to devise such action. He felt, too, that the matter was urgent. He slept uneasily despite his fatigue, because there was something in the back of his mind which warned him stridently that disaster lay ahead.

Freddy awoke still unrefreshed and stared dully at the ceiling over his head. He was trying discouragedly to envision a reasonable solution when there came a tap on his door. It was Bridges with a batch of papers.

"Here you are!" he said cheerfully, when Freddy opened to him. "Now we're all going to be happy!"

Freddy took the extended sheets.

"What's happened?" he asked. "Did the skipper send for fresh orders regardless, and I'm to go in the brig?"

Bridges, grinning, pointed to the sheets of paper in Freddy's hand. They were from the physiochemical officer, who was equipped to do exact surveys on the lesser heavenly bodies.

"Elements found in the alien vessel," was the heading of a list. Freddy scanned the list. No heavy elements, but the rest was familiar. There had been pure nitrogen in the fuel tank, he remembered, and the engineer officer was going quietly mad trying to understand how they had used nitrogen for atomic power. Freddy looked down to the bottom. Iron was the heaviest element present.

"Why should this make everybody happy?" asked Freddy.

Bridges pointed with his finger. The familiar atomic symbols had unfamiliar numerals by them. H^3, Li^5, Gl^8—He blinked. He saw N^{15}, F^{18}, $S^{34, 35}$—Then he stared. Bridges grinned.

"Try to figure what that ship's worth!" he said happily. "It's all over the *Arnina*. Prize money isn't allowed in the Patrol, but five percent of salvage is. Hydrogen three has been detected on Earth, but never isolated. Lithium five doesn't exist on Earth, or glucinium eight, or nitrogen fifteen or oxygen seventeen or fluorine eighteen or sulphur thirty-four or thirty-five! The whole ship is made up of isotopes that simply don't exist in the solar system! And you know what pure isotopes sell for! The hull's practically pure iron fifty-five! Pure iron fifty-four sells for thirty-five credits a gram! Talk about the lost treasures of Mars! For technical use only, the stripped hull of this stranger is worth ten years' revenue of Earth government! Every man on the *Arnina* is rich for life. And you're popular!"

Freddy did not smile.

"Nitrogen fifteen," he said slowly. "That's what's in the remaining fuel tank. It goes into a queer little aluminum chamber we couldn't figure out, and from there into the drive tubes. I see—"

He was very pale. Bridges beamed.

"A hundred thousand tons of materials that simply don't exist on Earth! Pure isotopes, intact! Not a contamination in a carload! My dear chap, I've come to like you, but you've been hated by everyone else. Now come out and bask in admiration and affection!"

Freddy said, unheeding:

"I've been wondering what that aluminum chamber was for. It looked so infernally simple, and I couldn't see what it did—"

"Come out and have a drink!" insisted Bridges joyously. "Be lionized! Make friends and influence people!"

"No," said Freddy. He smiled mirthlessly. "I'll be lynched later anyhow. Hm-m-m. I want to talk to the engineer officer. We want to get that ship navigating under its own power. It's too big to do anything with towlines."

"But nobody's figured out its engines!" protested Bridges. "Apparently there's nothing but a tiny trickle of nitrogen through a silly chamber that does something to it, and then it flows through aluminum baffles into the drive tubes. It's too simple! How are you going to make a thing like that work?"

"I think," said Freddy, "it's going to be horribly simple. That whole ship is made up of isotopes we don't have on Earth. No. It has aluminum and carbon. They're simple substances. Theirs and ours are just alike. But most of the rest—"

He was pale. He looked as if he were suffering.

"I'll get a couple of tanks made up, of aluminum, and filled with nitrogen. Plain air should do—And I'll want a gyro-control. I'll want it made of aluminum, too, with graphite bearings—"

He grinned mirthlessly at Bridges.

"Ever hear of the Ethical Equations, Bridges? You'd never expect them to suggest the answer to a space-drive problem, would you? But that's what they've done. I'll get the engineer officer to have those things made up. It's nice to have known you, Bridges—"

As Bridges went out, Freddy Holmes sat down, wetting his lips, to make sketches for the engineer officer to work from.

The control room and the engine room of the monster ship were one. It was a huge, globular chamber filled with apparatus of startlingly alien design. To Freddy, and to Bridges too, now, there was not so much of monstrousness as at first. Eight days of familiarity, and knowledge of how they worked, had made them seem almost normal. But still it was eerie to belt themselves before the instrument board, with only their hand lamps for illumination, and cast a last glance at the aluminum replacements of parts that had been made on some planet of another sun.

"If this works," said Freddy, and swallowed, "we're lucky. Here's the engine control. Cross your fingers, Bridges."

The interior of the hulk was still airless. Freddy shifted a queerly shaped lever an infinitesimal trace. There was a slight surging movement of the whole vast hull. A faint murmuring came through the fabric of the monster ship to the soles of their spacesuit boots. Freddy wet his lips and touched another lever.

"This should be lights."

It was. Images formed on the queerly shaped screens. The whole interior of the ship glowed. And the whole creation had been so alien as somehow to be revolting, in the harsh white light of the hand lamps the men had used. But now it was like a highly improbable fairy palace. The fact that all doors were circular and all passages round tubes was only pleasantly strange, in the many-colored glow of the ship's own lighting system. Freddy shook his head in his spacesuit helmet, as if to shake away drops of sweat on his forehead.

"The next should be heat," he said more grimly than before. "We do not touch that! Oh, definitely! But we try the drive."

The ship stirred. It swept forward in a swift smooth acceleration that was invincibly convincing of power. The *Arnina* dwindled swiftly behind. And Freddy, with compressed lips, touched controls here, and there, and the monstrous ship

obeyed with the docility of a willing, well-trained animal. It swept back to clear sight of the *Arnina.*

"I would say," said Bridges in a shaking voice, "that it works. The Patrol has nothing like this!"

"No," said Freddy shortly. His voice sounded sick. "Not like this! It's a sweet ship. I'm going to hook in the gyro controls. They ought to work. The creatures who made this didn't use them. I don't know why. But they didn't."

He cut off everything but the lights. He bent down and looked in the compact little aluminum device which would control the flow of nitrogen to the port and starboard drive tubes.

Freddy came back to the control board and threw in the drive once more. And the gyro control worked. It should. After all, the tool work of a Space Patrol machinist should be good. Freddy tested it thoroughly. He set it on a certain fine adjustment. He threw three switches. Then he picked up one tiny kit he had prepared.

"Come along," he said tiredly. "Our work's over. We go back to the *Arnina* and I probably get lynched."

Bridges, bewildered, followed him to the spidery little spaceboat. They cast off from the huge ship, now three miles or more from the *Arnina* and untenanted save by its own monstrous crew in suspended animation. The Space Patrol cruiser shifted position to draw near and pick them up. And Freddy said hardly:

"Remember the Ethical Equations, Bridges? I said they gave me the answer to that other ship's drive. If they were right, it couldn't have been anything else. Now I'm going to find out about something else."

His spacegloved hands worked clumsily. From the tiny kit he spilled out a single small object. He plopped it into something from a chest in the spaceboat—a mortar shell, as Bridges saw incredulously. He dropped that into the muzzle of a line-mortar the spaceboat carried as a matter of course. He jerked the lanyard. The mortar flamed. Expanding gases beat at the spacesuits of the men. A tiny, glowing, crimson spark sped toward outer space. Seconds passed. Three. Four. Five—

"Apparently I'm a fool," said Freddy, in the grimmest voice Bridges had ever heard.

But then there was light. And such light! Where the dwindling red spark of a tracer mortar shell had sped toward infinitely distant stars, there was suddenly an explosion of such incredible violence as even the proving-grounds of the Space Patrol had never known. There was no sound in empty space. There was no substance to be heated to incandescence other than that of a half-pound tracer shell. But there was a flare of blue-white light and a crash of such violent static that Bridges was deafened by it. Even through the glass of his helmet he felt a flash of savage heat. Then there was—nothing.

"What was that?" said Bridges, shaken.

"The Ethical Equations," said Freddy. "Apparently I'm not the fool I thought—"

The *Arnina* slid up alongside the little spaceboat. Freddy did not alight. He moved the boat over to its cradle and plugged in his communicator set. He talked over that set with his helmet phone, not radiating a signal that Bridges could pick up. In three minutes or so the great lock opened and four spacesuited figures came out. One wore the crested four-communicator helmet which only the skipper of a cruiser wears when in command of a landing party. The newcomers to the outside of the *Arnina*'s hull crowded into the little spaceboat. Freddy's voice sounded again in the headphones, grim and cold.

"I've some more shells, sir. They're tracer shells which have been in the work boat for eight days. They're not quite as cold as the ship, yonder—that's had two thousand years to cool off in—but they're cold. I figure they're not over eight or ten degrees absolute. And here are the bits of material from the other ship. You can touch them. Our spacesuits are as nearly nonconductive of heat as anything could be. You won't warm them if you hold them in your hand."

The skipper—Bridges could see him—looked at the scraps of metal Freddy held out to him. They were morsels of iron and other material from the alien ship. By the cold glare of a handlight the skipper thrust one into the threaded hollow at the nose of a mortar shell into which a line-end is screwed when a line is to be thrown. The skipper himself dropped in the mortar shell and fired it. Again a racing, receding speck of red in emptiness. And a second terrible, atomic blast.

The skipper's voice in the headphones:

"How much more of the stuff did you bring away?"

"Three more pieces, sir," said Freddy's voice, very steady now. "You see how it happens, sir. They're isotopes we don't have on Earth. And we don't have them because in contact with other isotopes at normal temperatures, they're unstable. They go off. Here we dropped them into the mortar shells and nothing happened, because both isotopes were cold—down to the temperature of liquid helium, or nearly. But there's a tracer compound in the shells, and it burns as they fly away. The shell grows warm. And when either isotope, in contact with the other, is as warm as . . . say . . . liquid hydrogen . . . why . . . they destroy each other. The ship yonder is of the same material. Its mass is about a hundred thousand tons. Except for the aluminum and maybe one or two other elements that also are nonisotopic and the same in both ships, every bit of that ship will blast off if it comes in contact with matter from this solar system above ten or twelve degrees absolute."

"Shoot the other samples away," said the skipper harshly. "We want to be sure—"

There were three violent puffs of gases expanding into empty space. There were three incredible blue-white flames in the void. There was silence. Then—

"That thing has to be destroyed," said the skipper, heavily. "We couldn't set it down anywhere, and its crew might wake up anyhow, at any moment. We haven't anything that could fight it, and if it tried to land on Earth—"

The alien monster, drifting aimlessly in the void, suddenly moved. Thin flames came from the gill-like openings at the bow. Then one side jetted more

strongly. It swung about, steadied, and swept forward with a terrifying smooth acceleration. It built up speed vastly more swiftly than any Earthship could possibly do. It dwindled to a speck. It vanished in empty space.

But it was not bound inward toward the sun. It was not headed for the plainly visible half-moon disk of Jupiter, now barely seventy million miles away. It headed out toward the stars.

"I wasn't sure until a few minutes ago," said Freddy Holmes unsteadily, "but by the Ethical Equations something like that was probable. I couldn't make certain until we'd gotten everything possible from it, and until I had everything arranged. But I was worried from the first. The Ethical Equations made it pretty certain that if we did the wrong thing we'd suffer for it . . . and by we I mean the whole Earth, because any visitor from beyond the stars would be bound to affect the whole human race." His voice wavered a little. "It was hard to figure out what we ought to do. If one of our ships had been in the same fix, though, we'd have hoped for—friendliness. We'd hope for fuel, maybe, and help in starting back home. But this ship was a warship, and we'd have been helpless to fight it. It would have been hard to be friendly. Yet, according to the Ethical Equations, if we wanted our first contact with an alien civilization to be of benefit to us, it was up to us to get it started back home with plenty of fuel."

"You mean," said the skipper, incredulously, "you mean you—"

"Its engines use nitrogen," said Freddy. "It runs nitrogen fifteen into a little gadget we know how to make, now. It's very simple, but it's a sort of atom smasher. It turns nitrogen fifteen into nitrogen fourteen and hydrogen. I think we can make use of that for ourselves. Nitrogen fourteen is the kind we have. It can be handled in aluminum pipes and tanks, because there's only one aluminum, which is stable under all conditions. But when it hits the alien isotopes in the drive tubes, it breaks down—"

He took a deep breath.

"I gave them a double aluminum tank of nitrogen, and bypassed their atom smasher. Nitrogen fourteen goes into their drive tubes, and they drive! And . . . I figured back their orbit, and set a gyro to head them back for their own solar system for as long as the first tank of nitrogen holds out. They'll make it out of the sun's gravitational field on that, anyhow. And I reconnected their thermo-batteries. When they start to wake up they'll see the gyro and know that somebody gave it to them. The double tank is like their own and they'll realize they have a fresh supply of fuel to land with. It . . . may be a thousand years before they're back home, but when they get there they'll know we're friendly and . . . not afraid of them. And meanwhile we've got all their gadgets to work on and work with—"

Freddy was silent. The little spaceboat clung to the side of the *Arnina,* which with its drive off was now drifting in sunward past the orbit of Jupiter.

"It is very rare," said the skipper ungraciously, "that a superior officer in the Patrol apologizes to an inferior. But I apologize to you, Mr. Holmes, for thinking you a fool. And when I think that I, and certainly every other Patrol officer

of experience, would have thought of nothing but setting that ship down at Patrol Base for study, and when I think what an atomic explosion of a hundred thousand tons of matter would have done to Earth . . . I apologize a second time."

Freddy said uncomfortably:

"If there are to be any apologies made, sir, I guess I've got to make them. Every man on the *Arnina* has figured he's rich, and I've sent it all back where it came from. But you see, sir, the Ethical Equations—"

When Freddy's resignation went in with the report of his investigation of the alien vessel, it was returned marked *"Not Accepted."*

And Freddy was ordered to report to a tiny, hard-worked spacecan on which a junior Space Patrol officer normally gets his ears pinned back and learns his work the hard way. And Freddy was happy, because he wanted to be a Space Patrol officer more than he wanted anything else in the world. His uncle was satisfied, too, because he wanted Freddy to be content, and because certain space-admirals truculently told him that Freddy was needed in the Patrol and would get all the consideration and promotion he needed without any politicians butting in. And the Space Patrol was happy because it had a lot of new gadgets to work with which were going to make it a force able not only to look after interplanetary traffic but defend it, if necessary.

And, for that matter, the Ethical Equations were satisfied.