

# Atom Drive

Charles L. Fontenay

The background of the lower half of the page is a vibrant green. Overlaid on this are several thick, bright blue geometric shapes. On the left, there is a large triangle pointing upwards. To its right is a vertical line. Further right is a horizontal line that turns 90 degrees downwards. Below these, there is a diagonal line sloping downwards from left to right. At the bottom, there is a curved line and a large 'X' shape formed by two intersecting diagonal lines.

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cover

# ATOM DRIVE

## BY CHARLES FONTENAY

*It was a race between the tortoise and the hare. But this hare was using some dirty tricks to make sure the ending would be different....*

Illustrated by Ed Emsch  
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The two spaceship crews were friendly enemies, sitting across the table from each other for their last meal before blastoff. Outside the ports, the sky was nothing but light-streaked blackness, punctured periodically by Earth glare, for Space Station 2 whirled swiftly on its axis, creating an artificial gravity.

"Jonner, I figured you the last man ever to desert the rockets for a hot-rod tow-job," chided Russo Baat, captain of the Mars Corporation's gleaming new freighter, *Marsward XVIII*. Baat was fat and red-faced, and one of the shrewdest space captains in the business.

Jonner Jons, at the other end of the table, inclined his grizzled head and smiled.

"Times change, Russo," he answered quietly. "Even the Mars Corporation can't stop that."

"Is it true that you're pulling five thousand tons of cargo, Captain?" asked one of the crewmen of the *Marsward XVIII*.

"Something like that," agreed Jonner, and his smile broadened. "And I have only about twice the fuel supply you carry for a 100-ton payload."

The communicator above them squawked and blared:

"Captain Jons and Captain Baat of Martian competition run, please report to

control for final briefing."

"I knew it!" grumbled Baat, getting heavily and reluctantly to his feet. "I haven't gotten to finish a meal on this blasted merry-go-round yet."

In the space station's control section, Commander Ortega of the Space Control Commission, an ascetic officer in plain blues, looked them up and down severely.

"As you know, gentlemen," he said, "blastoff time is 0600. Tonnage of cargo, fuel and empty vessels cannot be a factor, under the law. The Mars Corporation will retain its exclusive franchise to the Earth-Mars run, unless the ship sponsored by the Atom-Star Company returns to Earth with full cargo at least twenty hours ahead of the ship sponsored by the Mars Corporation. Cargo must be unloaded at Mars and new cargo taken on. I do not consider the twenty-hour bias in favor of the Mars Corporation a fair one," said Ortega severely, turning his gaze to Baat, "but the Space Control Commission does not make the laws. It enforces them. Docking and loading facilities will be available to both of you on an equal basis at Phobos and Marsport. Good luck."

He shook hands with both of them.

"Saturn, I'm glad to get out of there!" exclaimed Baat, mopping his brow as they left the control section. "Every time I take a step, I feel like I'm falling on my face."

"It's because the control section's so close to the center," replied Jonner. "The station's spinning to maintain artificial gravity, and your feet are away from the center. As long as you're standing upright, the pull is straight up and down to you, but actually your feet are moving faster than your head, in a larger orbit. When you try to move, as in normal gravity, your body swings out of that line of pull and you nearly fall. The best corrective, I've found, is to lean backward slightly when you start to walk."

As the two space captains walked back toward the wardroom together, Baat said:

"Jonner, I hear the Mars Corporation offered you the *Marsward XVIII* for this run first, and you turned them down. Why? You piloted the *Marsward V* and the *Wayward Lady* for Marscorp when those upstarts in the Argentine were trying to crack the Earth-Mars run. This Atom-Star couldn't have enough money to buy you away from Marscorp."

"No, Marscorp offered me more," said Jonner, soberly now. "But this atomic drive is the future of space travel, Russo. Marscorp has it, but they're sitting on it because they've got their fingers in hydrazine interests here, and the atom drive will make hydrazine useless for space fuel. Unless I can break the franchise for Atom-Star, it may be a hundred years before we switch to the atom drive in space."

"What the hell difference does that make to you?" asked Baat bluntly.

"Hydrazine's expensive," replied Jonner. "Reaction mass isn't, and you use less of it. I was born on Mars, Russo. Mars is my home, and I want to see my people get the supplies they need from Earth at a reasonable transport cost, not pay through the nose for every packet of vegetable seed."

They reached the wardroom door.

"Too bad I have to degrav my old chief," said Baat, chuckling. "But I'm a rocket man, myself, and I say to hell with your hot-rod atom drive. I'm sorry you got deflected into this run, Jonner; you'll never break Marscorp's orbit."



The *Marsward XVIII* was a huge vessel, the biggest the Mars Corporation ever had put into space. It was a collection of spheres and cylinders, joined together by a network of steel ties. Nearly 90% of its weight was fuel, for the one-way trip to Mars.

Its competitor, the *Radiant Hope*, riding ten miles away in orbit around the Earth, was the strangest looking vessel ever to get clearance from a space station. It looked like a tug towing a barge. The tug was the atomic power plant. Two miles behind, attached by a thin cable, was the passenger compartment and cargo.

On the control deck of the *Radiant Hope*, Jonner gripped a microphone and shouted profane instructions at the pilot of a squat ground-to-space rocket twenty miles away. T'an Li Cho, the ship's engineer, was peering out the port at the speck of light toward which Jonner was directing his wrath, while Qoqol, the Martian astrogator, worked at his charts on the other side of the deck.

"I thought all cargo was aboard, Jonner," said T'an.

"It is," said Jonner, laying the mike aside. "That G-boat isn't hauling cargo. It's going with us. I'm not taking any chances on Marscorp refusing to ferry our cargo back and forth at Mars."

"Is plotted, Jonner," boomed Qoqol, turning his head to peer at them with huge eyes through the spidery tangle of his thin, double-jointed arms and legs. He reached an eight-foot arm across the deck and handed Jonner his figures. Jonner gave them to T'an.

"Figure out power for that one, T'an," ordered Jonner, and took his seat in the cushioned control chair.

T'an pulled a slide rule from his tunic pocket, but his black almond eyes rested quizzically on Jonner.

"It's four hours before blastoff," he reminded.

"I've cleared power for this with Space Control," replied Jonner. "That planet-loving G-boat jockey missed orbit. We'll have to swing out a little and go to him."

On a conventional space craft, the order for acceleration would have sent the engineer to the engine deck to watch his gauges and report by intercom. But the *Radiant Hope's* "engine deck" was the atomic tug two miles ahead, which T'an, in heavy armor, would enter only in emergencies. He calculated for a moment, then called softly to Jonner:

"Pile One, in ten."

"In ten," confirmed Jonner, pulling a lever on the calibrated gauge of the radio control.

"Pile Two, in fifteen."

"In fifteen."

"Check. I'll have the length of burst figured for you in a jiffy."

A faint glow appeared around the atomic tug far ahead, and there was the faintest shiver in the ship. But after a moment, Qoqol said in a puzzled tone:

"No Gs, Jonner. Engine not work?"

"Sure, she's working," said Jonner with a grin. "You'll never get any more G than

we've got now, Qoqol, all the way to Mars. Our maximum acceleration will be 1/3,000th-G."

"One three-thousandth?" exclaimed T'an, shaken out of his Oriental calm. "Jonner, the *Marsward* will blast away at one or two Gs. How do you expect to beat that at 1/3,000th?"

"Because they have to cut off and coast most of the way in an elliptic orbit, like any other rocket," answered Jonner calmly. "We drive straight across the system, under power all the time. We accelerate half way, decelerate the other half."

"But 1/3,000th!"

"You'll be surprised at what constant power can do. I know Baat, and I know the trick he's going to use. It's obvious from the blastoff time they arranged. He's going to tack off the Moon and use his power right to cut 20 days off that regular 237-day schedule. But this tug-boat will make it in 154 days!"

They took aboard the 200-ton landing boat. By the time they got it secured, the radio already was sounding warnings for blastoff.

Zero hour arrived. Again Jonner pulled levers and again the faint glow appeared around the tail of their distant tug. Across space the exhaust of the *Marsward XVIII* flared into blinding flame. In a moment, it began to pull ahead visibly and soon was receding like a meteor.

Near the *Radiant Hope*, the space station seemed not to have changed position at all.

"The race is not always to the swift," remarked Jonner philosophically.

"And we're the tortoise," said T'an. "How about filling us in on this jaunt, Jonner?"

"Is should, Jonner," agreed Qoqol. "T'an know all about crazy new engine, I know all about crazy new orbit. Both not know all. You tell."

"I planned to, anyway," said Jonner. "I had figured on having Serj in on it, but he wouldn't understand much of it anyhow. There's no use in waking him up."

Serj was the ship's doctor-psychologist and fourth member of the crew. He was asleep below on the centerdeck.



"For your information, Qoqol," said Jonner, "the atomic engine produces electrical energy, which accelerates reaction mass. Actually, it's a crude ion engine. T'an can explain the details to you later, but the important thing is that the fuel is cheap, the fuel-to-cargo ratio is low and constant acceleration is practical.

"As for you, Tan, I was surprised at your not understanding why we'll use low acceleration. To boost the engine power and give us more Gs, we'd either have to carry more fuel or coast part of the way on momentum, like an ordinary rocket. This way's more efficient, and our 63-day margin over the *Marsward* each way is more than enough for unloading and loading more cargo and fuel."

"With those figures, I can't see how Marscorp expects to win this competition," said T'an.

"We've got them, flat, on the basis of performance," agreed Jonner. "So we'll have to watch for tricks. I know Marscorp. That's why I arranged to take aboard that G-boat at the last minute. Marscorp controls all the G-boats at Marsport, and they're smart enough to keep us from using them, in spite of the Space Control Commission. As for refueling for the return trip, we can knock a chunk off of Phobos for reaction mass."

The meteor alarm bells clanged suddenly, and the screen lit up once with a fast-moving red line that traced the path of the approaching object.

"Miss us about half a mile," said Jonner after a glance at the screen. "Must be pretty big ... and it's coming *up*!"

He and T'an floated to one of the ports, and in a few moments saw the object speed by.

"That's no meteor!" exclaimed Jonner with a puzzled frown. "That's man-made. But it's too small for a G-boat."

The radio blared: "All craft in orbit near Space Station 2! Warning! All craft near Space Station 2! Experimental missile misfired from White Sands! Repeat: experimental missile misfired from White Sands! Coordinates...."

"Fine time to tell us," remarked T'an drily.

"Experimental missile, hell!" snorted Jonner, comprehension dawning. "Qoqol, what would have happened if we hadn't shifted orbit to take aboard that G-boat?"

Qoqol calculated a moment.

"Hit our engines," he announced. "Dead center."

Jonner's blue eyes clouded ominously. "Looks like they're playing for keeps this time, boys."



The brotherhood of spacemen is an exclusive club. Any captain, astrogator or engineer is likely to be well known to his colleagues, either personally or by reputation.

The ship's doctor-psychologist is in a different category. Most of them sign on for a few runs for the adventure of it, as a means of getting back and forth between planets without paying the high cost of passage or to pick up even more money than they can get from lucrative planetbound practice.

Jonner did not know Serj, the *Radiant Hope's* doctor. Neither T'an nor Qoqol ever had heard of him. But Serj appeared to know his business well enough, and was friendly enough.

It was Serj's first trip and he was very interested in the way the ship operated. He nosed into every corner of it and asked a hundred questions a day.

"You're as inquisitive as a cadet spaceman, Serj," Jonner told him on the twenty-fifth day out. Everybody knew everyone else well by then, which meant that Jonner and Qoqol, who had served together before, had become acquainted with T'an and Serj.

"There's a lot to see and learn about space, Captain," said Serj. He was a young fellow, with fair hair and an easy grin. "Think I could go outside?"

"If you keep a lifeline hooked on. The suits have magnetic shoes to hold you to the hull of the ship, but you can lose your footing."

"Thanks," said Serj. He touched his hand to his forehead and left the control deck.

Jonner, near the end of his eight-hour duty shift, watched the dials.

The red light showing the inner airlock door was open blinked on. It blinked off,

then the outer airlock indicator went on, and off.

A shadow fell across Jonner briefly. He glanced at the port and reached for the microphone.

"Careful and don't step on any of the ports," he warned Serj. "The magnetic soles won't hold on them."

"I'll be careful, sir," answered Serj.

No one but a veteran spaceman would have noticed the faint quiver that ran through the ship, but Jonner felt it. Automatically, he swung his control chair and his eyes swept the bank of dials.

At first he saw nothing. The outer lock light blinked on and off, then the inner lock indicator. That was Serj coming back inside.

Then Jonner noted that the hand on one dial rested on zero. Above the dial was the word: "ACCELERATION."

His eyes snapped to the radio controls. The atomic pile levers were still at their proper calibration. The dials above them said the engines were working properly.

The atomic tug was still accelerating, but passengers and cargo were in free fall.

Swearing Jonner jerked at the levers to pull out the piles aboard the tug.

A blue flash flared across the control board, momentarily blinding him. Jonner recoiled, only his webbed safety belt preventing him from plummeting from the control chair.

He swung back anxiously to the dials, brushing futilely at the spots that swam before his eyes. He breathed a sigh of relief. The radio controls had operated. The atomic engines had ceased firing.

Tentatively, cautiously, he reversed the lever. There was no blue flash this time, but neither did the dials quiver. He swore. Something had burned out in the radio controls. He couldn't reverse the tug.

He punched the general alarm button viciously, and the raucous clangor of the bell sounded through the confines of the ship. One by one, the other crew members popped up to the control deck from below.

He turned the controls over to Qoqol.

"Take readings on that damn tug," Jonner ordered. "I think our cable broke. T'an, let's go take a look."

When they got outside, they found about a foot of the one-inch cable still attached to the ship. The rest of it, drawn away by the tug before Jonner could cut acceleration, was out of sight.

"Can it be welded, T'an?"

"It can, but it'll take a while," replied the engineer slowly. "First, we'll have to reverse that tug and get the other end of that break."

"Damn, and the radio control's burned out. I tried to reverse it before I sounded the alarm. T'an, how fast can you get those controls repaired?"

"Great space!" exclaimed T'an softly. "Without seeing it, I'd say at least two days, Jonner. Those controls are complicated as hell."

They re-entered the ship. Qoqol was working at his diagrams, and Serj was looking over his shoulder. Jonner took a heat-gun quietly from the rack and pointed it at Serj.

"You'll get below, mister," he commanded grimly. "You'll be handcuffed to your bunk from here on out."

"Sir?... I don't understand," stammered Serj.

"Like hell you don't. You cut that cable," Jonner accused.

Serj started to shrug, but he dropped his eyes.

"They paid me," he said in a low tone. "They paid me a thousand solars."

"What good would a thousand solars do you when you're dead, Serj ... dead of suffocation and drifting forever in space?"

Serj looked up in astonishment.

"Why, you can still reach Earth by radio, easy," he said. "It wouldn't take long for a rescue ship to reach us."

"Chemical rockets have their limitations," said Jonner coldly.

"And you don't realize what speed we've built up with steady acceleration. We'd

head straight out of the system, and nothing could intercept us, if that tug had gotten too far before we noticed it was gone."

He jabbed the white-faced doctor with the muzzle of the heat-gun.

"Get below," he ordered. "I'll turn you over to Space Control at Mars."

When Serj had left the control deck, Jonner turned to the others. His face was grave.

"That tug picked up speed before I could shut off the engines, after the cable was cut," he said. "It's moving away from us slowly, and at a tangent. And solar gravity's acting on both bodies now. By the time we get those controls repaired, the drift may be such that we'll waste weeks maneuvering the tug back."

"I could jet out to the tug in a spacesuit, before it gets too far away," said T'an thoughtfully. "But that wouldn't do any good. There's no way of controlling the engines, at the tug. It has to be done by radio."

"If we get out of this, remind me to recommend that atomic ships always carry a spare cable," said Jonner gloomily. "If we had one, we could splice them and hold the ship to the tug until the controls are repaired."

"Is cable in cargo strong enough, Jonner?" asked Qoqol.

"That's right!" exclaimed Jonner, brightening. "Most of our cargo's cable! That 4,000-ton spool we're hauling back there is 6,000 miles of cable to lay a television network between the Martian cities."

"Television cable?" repeated T'an doubtfully. "Will that be strong enough?"

"It's bound in flonite, that new fluorine compound. It's strong enough to tow this whole cargo at a couple of Gs. There's nothing aboard this ship that would cut off a length of it—a heat-gun at full power wouldn't even scorch it—but we can unwind enough of it, and block the spool. It'll hold the ship to the tug until the controls can be repaired, then we can reverse the tug and weld the cable."

"You mean the whole 6,000 miles of it's in one piece?" demanded T'an in astonishment.

"That's not so much. The cable-laying steamer *Dominia* carried 3,000 miles in one piece to lay Atlantic cables in the early 20th century."

"But how'll we ever get 4,000 tons in one piece down to Mars?" asked T'an. "No G-boat can carry that load."

Jonner chuckled.

"Same way they got it up from Earth to the ship," he answered. "They attached one end of it to a G-boat and sent it up to orbit, then wound it up on a fast winch. Since the G-boat will be decelerating to Mars, the unwinding will have to be slowed or the cable would tangle itself all over Syrtis."

"Sounds like it's made to order," said T'an, grinning. "I'll get into my spacesuit."

"You'll get to work on the radio controls," contradicted Jonner, getting up. "That's something I can't do, and I can get into a spacesuit and haul a length of cable out to the tug. Qoqol can handle the winch."



Deveet, the Atom-Star Company's representative at Mars City, and Kruger of the Space Control Commission were waiting when the *Radiant Hope's* G-boat dropped down from the Phobos station and came to rest in a wash of jets. They rode out to the G-boat together in a Commission groundcar. Jonner emerged from the G-boat, following the handcuffed Serj.

"He's all yours," Jonner told Kruger, gesturing at Serj. "You have my radio reports on the cable-cutting, and I'll make my log available to you."

Kruger put his prisoner in the front seat of the groundcar beside him, and Jonner climbed in the back seat with Deveet.

"I brought the crates of dies for the groundcar factory down this time," Jonner told Deveet. "We'll bring down all the loose cargo before shooting the television cable down. While they're unloading the G-boat, I wish you'd get the tanks refilled with hydrazine and nitric acid. I've got enough to get back up, but not enough for a round trip."

"What do you plan to do?" asked Deveet. He was a dark-skinned, long-faced man with a sardonic twist to his mouth.

"I've got to sign on a new ship's doctor to replace Serj. When the *Marsward* comes in, Marscorp will have a dozen G-boats working round the clock to

unload and reload her. With only one G-boat, we've got to make every hour count. We still have reaction mass to pick up on Phobos."

"Right," agreed Deveet. "You can take the return cargo up in one load, though. It's just twenty tons of Martian relics for the Solar Museum. Mars-to-Earth cargos run light."

At the administration building, Jonner took his leave of Deveet and went up to the Space Control Commission's personnel office on the second floor. He was in luck. On the board as applying for a Mars-Earth run as ship's doctor-psychologist was one name: Lana Elden.

He looked up the name in the Mars City directory and dialed into the city from a nearby telephone booth. A woman's voice answered.

"Is Lana Elden there?" asked Jonner.

"I'm Lana Elden," she said.

Jonner swore under his breath. A woman! But if she weren't qualified, her name would not have been on the Commission board.

The verbal contract was made quickly, and Jonner cut the Commission monitor into the line to make it binding. That was done often when rival ships, even of the same line, were bidding for the services of crewmen.

"Blastoff time is 2100 tonight," he said, ending the interview. "Be here."

Jonner left the personnel office and walked down the hall. At the elevator, Deveet and Kruger hurried out, almost colliding with him.

"Jonner, we've run into trouble!" exclaimed Deveet. "Space Fuels won't sell us any hydrazine and nitric acid to refill the tanks. They say they have a new contract with Marscorp that takes all their supply."

"Contract, hell!" snorted Jonner. "Marscorp owns Space Fuels. What can be done about it, Kruger?"

Kruger shook his head.

"I'm all for you, but Space Control has no jurisdiction," he said. "If a private firm wants to restrict its sales to a franchised line, there's nothing we can do about it. If you had a franchise, we could force them to allot fuel on the basis of cargo

handled, since Space Fuels has a monopoly here. But you don't have a franchise yet."

Jonner scratched his grey head thoughtfully.

It was a serious situation. The atom-powered *Radiant Hope* could no more make a planetary landing than the chemically-powered ships. Its power gave a low, sustained thrust that permitted it to accelerate constantly over long periods of time. To beat the powerful pull of planetary surface gravity, the terrific burst of quick energy from the streamlined G-boats, the planetary landing craft, was needed.

"We can still handle it," Jonner said at last. "With only twenty tons return cargo, we can take it up this trip. Add some large parachutes to that, Deveet. We'll shoot the end of the cable down by signal rocket, out in the lowlands, and stop the winch when we've made contact, long enough to attach the rest of the cargo to the cable. Pull it down with the cable and, with Mars' low gravity, the parachutes will keep it from being damaged."

But when Jonner got back to the landing field to check on unloading operations, his plan was smashed. As he approached the G-boat, a mechanic wearing an ill-concealed smirk came up to him.

"Captain, looks like you sprung a leak in your fuel line," he said. "All your hydrazine's leaked out in the sand."

Jonner swung from the waist and knocked the man flat. Then he turned on his heel and went back to the administration building to pay the 10-credit fine he would be assessed for assaulting a spaceport employee.



The Space Control Commission's hearing room in Mars City was almost empty. The examiner sat on the bench, resting his chin on his hand as he listened to testimony. In the plaintiff's section sat Jonner, flanked by Deveet and Lana Elden. In the defense box were the Mars Corporation attorney and Captain Russo Baat of the *Marsward XVIII*. Kruger, seated near the rear of the room, was the only spectator.

The Mars Corporation attorney had succeeded in delaying the final hearing more



than a 42-day Martian month by legal maneuvers. Meanwhile, the *Marsward XVIII* had blasted down to Phobos, and G-boats had been shuttling back and forth unloading the vessel and reloading it for the return trip to Earth.

When testimony had been completed, the examiner shuffled through his papers. He put on his spectacles and peered over them at the litigants.

"It is the ruling of this court," he said formally, "that the plaintiffs have not presented sufficient evidence to prove tampering with the fuel line of the G-boat of the spaceship *Radiant Hope*. There is no evidence that it was cut or burned, but only that it was broken. The court must remind the plaintiffs that this could have been done accidentally, through inept handling of cargo.

"Since the plaintiffs have not been able to prove their contention, this court of complaint has no alternative than to dismiss the case."

The examiner arose and left the hearing room. Baat waddled across the aisle, puffing.

"Too bad, Jonner," he said. "I don't like the stuff Marscorp's pulling, and I think you know I don't have anything to do with it.

"I want to win, but I want to win fair and square. If there's anything I can do to help...."

"Haven't got a spare G-boat in your pocket, have you?" retorted Jonner, with a rueful smile.

Baat pulled at his jowls.

"The *Marsward* isn't carrying G-boats," he said regretfully. "They all belong to the port, and Marscorp's got them so tied up you'll never get a sniff of one. But if you want to get back to your ship, Jonner, I can take you up to Phobos with me, as my guest."

Jonner shook his head.

"I figure on taking the *Radiant Hope* back to Earth," he said. "But I'm not blasting off without cargo until it's too late for me to beat you on the run."

"You sure? This'll be my last ferry trip. The *Marsward* blasts off for Earth at 0300 tomorrow."

"No, thanks, Russo. But I will appreciate your taking my ship's doctor, Dr. Elden, up to Phobos."

"Done!" agreed Baat. "Let's go, Dr. Elden. The G-boat leaves Marsport in two hours."

Jonner watched Baat puff away, with the slender, white-clad brunette at his side. Baat personally would see Lana Elden safely aboard the *Radiant Hope*, even if it delayed his own blastoff.

Morosely, he left the hearing room with Deveet.

"What I can't understand," said the latter, "is why all this dirty work, why didn't Marscorp just use one of their atom-drive ships for the competition run?"

"Because whatever ship is used on a competition run has to be kept in service on the franchised run," answered Jonner. "Marscorp has millions tied up in hydrazine interests, and they're more interested in keeping an atomic ship off this run than they are in a monopoly franchise. But they tie in together: if Marscorp loses the monopoly franchise and Atom-Star puts in atom-drive ships, Marscorp will have to switch to atom-drive to meet the competition."

"If we had a franchise, we could force Space Fuels to sell us hydrazine," said Deveet unhappily.

"Well, we don't. And, at this rate, we'll never get one."



Jonner and Deveet were fishing at the Mars City Recreation Center. It had been several weeks since the *Marsward XVIII* blasted off to Earth with a full cargo. And still the atomic ship *Radiant Hope* rested on Phobos with most of her Marsbound cargo still aboard; and still her crew languished at the Phobos space station; and still Jonner moved back and forth between Mars City and Marsport daily, racking his brain for a solution that would not come.

"How in space do you get twenty tons of cargo up to an orbit 5,800 miles out, without any rocket fuel?" he demanded of Deveet more than once. He received no satisfactory answer.

The Recreation Center was a two-acre park that lay beneath the plastic dome of

Mars City. Above them they could see swift-moving Phobos and distant Deimos among the other stars that powdered the night. In the park around them, colonists rode the amusement machines, canoed along the canal that twisted through the park or sipped refreshment at scattered tables. A dozen or more sat, like Jonner and Deveet, around the edge of the tiny lake, fishing.

Deveet's line tightened. He pulled in a streamlined, flapping object from which the light glistened wetly.

"Good catch," complimented Jonner. "That's worth a full credit."

Deveet unhooked his catch and laid it on the bank beside him. It was a metal fish: live fish were unknown on Mars. They paid for the privilege of fishing for a certain time and any fish caught were "sold" back to the management at a fixed price, depending on size, to be put back into the lake.

"You're pretty good at it," said Jonner. "That's your third tonight."

"It's all in the speed at which you reel in your line," explained Deveet. "The fish move at pre-set speeds. They're made to turn and catch a hook that moves across their path at a slightly slower speed than they're swimming. The management changes the speeds once a week to keep the fishermen from getting too expert."

"You can't beat the management," chuckled Jonner. "But if it's a matter of matching orbital speeds to make contact, I ought to do pretty well when I get the hang of it."

He cocked an eye up toward the transparent dome. Phobos had moved across the sky into Capricorn since he last saw her. His memory automatically ticked off the satellite's orbital speed: 1.32 miles a second; speed in relation to planetary motion....

Why go over that again? One had to have fuel first. Meanwhile, the *Radiant Hope* lay idle on Phobos and its crew whiled away the hours at the space station inside the moon, their feet spinning faster than their heads ... no, that wasn't true on Phobos, because it didn't have a spin to impart artificial gravity, like the space stations around Earth.

He sat up suddenly. Deveet looked at him in surprise. Jonner's lips moved silently for a moment, then he got to his feet.

"Where can we use a radiophone?" he asked.

"One in my office," said Deveet, standing up.

"Let's go. Quick, before Phobos sets."

They turned in their rods, Deveet collecting the credits for his fish, and left the Recreation Center.

When they reached the Atom-Star Company's Martian office Jonner plugged in the radiophone and called the Phobos space station. He got T'an.

"All of you get aboard," Jonner ordered. "Then have Qoqol call me."

He signed off and turned to Deveet. "Can we charter a plane to haul our Earthbound cargo out of Marsport?"

"A plane? I suppose so. Where do you want to haul it?"

"Charax is as good as any other place. But I need a fast plane."

"I think we can get it. Marscorp still controls all the airlines, but the Mars government keeps a pretty strict finger on their planetbound operations. They can't refuse a cargo haul without good reason."

"Just to play safe, have some friend of yours whom they don't know, charter the plane in his name. They won't know it's us till we start loading cargo."

"Right," said Deveet, picking up the telephone. "I know just the man."



Towmotors scuttled across the landing area at Marsport, shifting the cargo that had been destined for the *Radiant Hope* from the helpless G-boat to a jet cargo-plane. Nearby, watching the operation, were Jonner and Deveet, with the Marsport agent of Mars Air Transport Company.

"We didn't know Atom-Star was the one chartering the plane until you ordered the G-boat cargo loaded on it," confessed the Mars-Air agent.

"I see you and Mr. Deveet are signed up to accompany the cargo. You'll have to rent suits for the trip. We have to play it safe, and there's always the possibility of a forced landing."

"There are a couple of spacesuits aboard the G-boat that we want to take along,"

said Jonner casually. "We'll just wear those instead."

"Okay." The agent spread his hands and shrugged. "Everybody at Marsport knows about you bucking Marscorp, Captain. What you expect to gain by transferring your cargo to Charax is beyond me, but it's your business."

An hour later, the chartered airplane took off with a thunder of jets. Aboard was the 20-ton cargo the *Radiant Hope* was supposed to carry to Earth, plus some large parachutes. The Mars-Air pilot wore a light suit with plastic helmet designed for survival in the thin, cold Martian air. Jonner and Deveet wore the bulkier spacesuits.

Five minutes out of Marsport, Jonner thrust the muzzle of a heat-gun in the pilot's back.

"Set it on automatic, strap on your parachute and bail out," he ordered. "We're taking over."

The pilot had no choice. He went through the plane's airlock and jumped, helped by a hearty boost from Jonner. His parachute blossomed out as he drifted down toward the green Syrtis Major Lowland. Jonner didn't worry about him. He knew the pilot's helmet radio would reach Marsport and a helicopter would rescue him shortly.

"I don't know what you're trying to do, Jonner," said Deveet apprehensively over his spacehelmet radio. "But whatever it is, you'd better do it fast. They'll have every plane on Mars looking for us in half an hour."

"Let 'em look, and keep quiet a while," retorted Jonner. "I've got some figuring to do."

He put the plane on automatic, took off the spacesuit handhooks and scribbled figures on a scrap of paper. He tuned in the plane's radio and called Qoqol on Phobos. They talked to each other briefly in Martian.

The darker green line of a canal crossed the green lowland below them.

"Good, there's Drosinas," muttered Jonner. "Let's see, time 1424 hours, speed 660 miles an hour...."

Jonner boosted the jets a bit and watched the terrain.

"By Saturn, I almost overran it!" he exclaimed. "Deveet, smash out those ports."

"Break out the ports?" repeated Deveet. "That'll depressurize the cabin!"

"That's right. So you'd better be sure your spacesuit's secure."

Obviously puzzled, Deveet strode up and down the cabin, knocking out its six windows with the handhooks of his spacesuit. Jonner maneuvered the plane gently, and set it on automatic. He got out of the pilot's seat and strode to the right front port.

Reaching through the broken window, he pulled in a section of cable that was trailing alongside. While the baffled Deveet watched, he reeled it in until he brought up the end of it, to which was attached a fish-shaped finned metal missile.

Jonner carried the cable end and the attached missile across the cabin and tossed it out the broken front port on the other side, swinging it so that the 700-mile-an-hour slipstream snapped it back in through the rearmost port like a bullet.

"Pick it up and pass it out the right rear port," he commanded. "We'll have to pass it to each other from port to port. The slipstream won't let us swing it forward and through."

In a few moments, the two of them had worked the missile and the cable end to the right front port and in through it. Originating above the plane, it now made a loop through the four open ports. Jonner untied the missile and tied the end to the portion which came into the cabin, making a bowline knot of the loop. Deveet picked up the missile from the floor, where Jonner had thrown it.

"Looks like a spent rocket shell," he commented.

"It's a signal rocket," said Jonner. "The flare trigger was disconnected."

He picked up the microphone and called the *Radiant Hope* on Phobos.

"We've hooked our fish, Qoqol," he told the Martian, and laid the mike aside.

"What does that mean?" asked Deveet.

"Means we'd better strap in," said Jonner, suiting the action to the words. "You're in for a short trip to Phobos, Deveet."

Jonner pulled back slowly on the elevator control, and the plane began a shallow climb. At 700 miles an hour, it began to attain a height at which its broad wings

—broader than those of any terrestrial plane—would not support it.

"I'm trying to decide," said Deveet with forced calm, "whether you've flipped your helmet."

"Nope," answered Jonner. "Trolling for those fish in Mars City gave me the idea. The rest was no more than an astrogation problem, like any rendezvous with a ship in a fixed orbit, which Qoqol could figure. Remember that 6,000-mile television cable the ship's hauling? Qoqol just shot the end of it down to Mars' surface by signal rocket, we hooked on and now he'll haul us up to Phobos. He's got the ship's engine hooked onto the cable winch."

The jets coughed and stopped. The plane was out of fuel. It was on momentum—to be drawn by the cable, or to snap it and fall.

"Impossible!" cried Deveet in alarm. "Phobos' orbital speed is more than a mile a second! No cable can take the sudden difference in that and the speed we're traveling. When the slack is gone, it'll break!"

"The slack's gone already. You're thinking of the speed of Phobos, *at Phobos*. At this end of the cable, we're like the head of a man in the control section of a space station, which is traveling slower than his feet because its orbit is smaller—but it revolves around the center in the same time.

"Look," Jonner added, "I'll put it in round numbers. Figure your cable as part of a radius of Phobos' orbit. Phobos travels at 1.32, but the other end of the radius travels at zero because it's at the center. The cable end, at the Martian surface, travels at a speed in between—roughly 1,200 miles an hour—but it keeps up with Phobos' revolution. Since the surface of Mars itself rotates at 500 miles an hour, all I had to do was boost the plane up to 700 to match the speed of the cable end.

"That cable will haul a hell of a lot more than twenty tons, and that's all that's on it right now. By winching us up slowly, there'll never be too great a strain on it."

Deveet looked apprehensively out of the port. The plane was hanging sidewise now, and the distant Martian surface was straight out the left-hand ports. The cable was holding.

"We can make the trip to Earth 83 days faster than the *Marsward*," said Jonner, "and they have only about 20 days' start. It won't take us but a few days to make Phobos and get this cable and the rest of the cargo shot back to Mars. Atom-Star

will get its franchise, and you'll see all spaceships switching to the atomic drive within the next decade."

"How about this plane?" asked Deveet. "We stole it, you know."

"You can hire a G-boat to take it back to Marsport," said Jonner with a chuckle. "Pay Mars-Air for the time and the broken ports, and settle out of court with that pilot we dropped. I don't think they'll send you to jail, Deveet."

He was silent for a few minutes.

"By the way, Deveet," said Jonner then, "radio Atom-Star to buy some flonite cable of their own and ship it to Phobos. Damned if I don't think this is cheaper than G-boats!"



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