

PLANET STORIES



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The Vibro-spacedrive was powerful, efficient, perfect —almost. It had one bad habit, and a mystery. The habit: It often exploded, which everybody knew. The mystery: McCall was to know that, too . . . one terrible day in deep space, near the flaming jaws of the Sun . . .



■ safety margin

A SHORT STORY

By

J. T.

M'INTOSH

LAST MAN ABOARD THE *IONIC II* was the Engineer. It was not until a tall, unhurried figure started the long walk from the control tower that the curiosity of the crew was satisfied. They knew him. He was Jeff Bremner, a slow-speaking oldster who had made many trips on the *Ionic II* and as far as they were concerned could make many more.

Engineers were attached to no particular ship or run; they were government officials, and not really engineers. Some of them were cordially and automatically hated on any ship they boarded. They were, in theory at any rate, in supreme command in space, and not every man could take a job like that and look pleasant. Bremner was one who could. He could talk and he could listen. He could give advice if asked without sending in little notes at the end of the journey: "Second Officer Smith revealed astonishing ignorance of points 10 and 29 of the Spaceman's Code," or "Spaceman J. Brown appears to have had time since the completion of his training to develop a certain laxity in his application of the section on discipline." He would help out in an emergency without reporting coldly on the inefficiency or insufficiency of the ship's complement. And if there was some fault he had to report, he would satisfy himself that the fault, if unchecked, was liable to recur before he did so.

So there was friendliness and some relief in the crew's greetings as Bremner came aboard. Discipline on the *Ionic II* was easy, normally. The ship was one of the seven run by the small Sapphire Line, in which it was a tradition that directors made some allowance for management, management was not harsh with captains, captains kept crew on a loose rein, and crew didn't bother themselves too much. Essential standards were maintained, but what was regarded as essential was the spirit and not the letter of various codes of laws. Men who had been warned that for the duration of the run to Venus and back they might have to obey the letter and not the spirit for a change relaxed gratefully from the time that the keenest-sighted among them recognized the thin figure of Bremner across the field.

"Hallo, Jeff," said Captain Hofmeyer, stretching out his hand. "I thought you were on leave."

"I was," Bremner replied, "but it was put back. Again." He grinned, not a young grin, but with the resignation of an old man who was not as old or tired as he pretended.

"Mmm," said Hofmeyer cautiously.

"You wouldn't like to say whom you replaced?"

"Watson. And if you don't take that expression off your face I'll describe it in my report."

BREMNER FOLLOWED the captain and his second officer to the control room, not as if he owned the ship, but like a passenger there on sufferance. Perhaps, he reflected, he was too easy-going. No, certainly he was. But one couldn't be vigilant and unapproachable on a hundred trips for the sake of a situation which might arise on the hundred and first.

He glanced casually at the papers. If they did not satisfy him, he had power even yet, with all the passengers and cargo aboard, and the official take-off time twenty seconds off, to stop the trip. But the papers were all right. They always were on the Sapphire Line. It was on smaller lines—and one or two bigger ones—that real vigilance was needed.

"Going to ground us?" asked Hofmeyer.

"What do you think? Any reason why I should?"

Hofmeyer grinned and shook his head, turning to the bank of controls. He was a young captain, Hofmeyer. Perhaps too young. He hadn't had years as a subordinate to give him stability. There had never been a blemish on his record, which was in a way unfortunate for him, for he had never had a chance to learn by his own mistakes. He was like a car driver who had never been in a skid or an accident, who had never seen death for himself or others if he could not pull up in ten yards, who had never known brakes or steering or engine to fail. When the emergency came at last, he might be able to handle it. Nobody knew. Bremner hoped he would. Bremner had seen Hofmeyer's wife once or twice—a grand girl, the kind of girl Hofmeyer with his invariable good luck or good judgment would have married.

McCall, the second officer, was of a different stamp. He was twenty years older than Hofmeyer, very little younger than Bremner himself. To McCall everything had gone wrong. Bremner knew the space-

men he traveled with, and these two as well as any. Over thirty years since Jim McCall had been set to pass out of training school with the best record of his year. Then, on his last month before grading, emergency had forced him into temporary command of a ship in a dangerous situation. It was tough luck on any trainee. He had not done badly, and there was every attempt to make allowance for him. But he could not be given top grading, and that was the pattern for the next thirty years of his career. He had married at the same age as Hofmeyer, but his wife had left him two years later.

Strangely enough, Bremner knew of no closer friendship than between the two men. Other officers came and went, but no ship ever reached space with a berth for one and not for the other. For ten years, in various capacities, but always some two steps apart, they had traveled space together.

The first officer came in with the astrogation correlates. Merson was a man utterly without capacity for anger or ambition. He had reached his position because he had done well enough to be put there. If promotion were not in some measure automatic, Merson would still be a space-hand.

"Mr. Bremner?" said Merson, holding out the calculations interrogatively. He hadn't known Bremner long enough for familiarity. Bremner nodded the papers away.

"They've been checked, I suppose?" he said.

"Hereditry should be all right," Merson replied. "They come from a long line of astrogators."

Bremner grinned. "Is that new, or have you cracked it before?"

"He nearly broke it on the run in," murmured Hofmeyer.

HOFMEYER TOOK THE SHIP up gently on the rockets. Then when it was a thousand feet off the ground he stabbed the vibrodrive and held it until the bell rang. Bremner frowned. Ten seconds' coasting, then the drive went on again. This time Hofmeyer just missed the bell, but there could only have been

a split second in it. As if to show that he could get closer than that, the third time Hofmeyer got an instant more of drive, and still beat the bell. Then Hofmeyer switched to automatic, and the ship built up velocity in five-second bursts.

"Mr. Merson," said Bremner. "And Mr. McCall. I'd like to speak to the captain for a moment."

They hesitated. No single man could be left in control—not even an Engineer. Two officers had to stay at control, or, rarely, one officer and the Engineer. But they knew, and Hofmeyer knew, what Bremner wanted. Hofmeyer had been asking for it. And even Bremner had to give it to him. McCall and Merson went out silently.

"I know," said Hofmeyer cheerfully. "But it's safe. You get a mind like a chronometer after a bit—up to ten seconds anyway. I've never had less than two seconds to spare."

"Sometimes," said Bremner carefully, "a man can lose two seconds. He can remember something important he's forgotten. Someone can speak to him. He can lose his balance or get sudden cramp. A hundred things can happen to prevent him touching a button until it's too late."

"But if he can lose two seconds he can lose three."

"It's not just one and half times as unlikely. It's far more than that. Hofmeyer, don't think I'm just making pettifogging objections. You know what happens if the drive's on too long. Chain reaction. Easy to start and absolutely impossible to stop. For a hundred years we've been trying to find some safe way of destroying the affected part, so that even if the drive was on too long it would be possible to annihilate the whole mechanism and the reaction with it. It can't be done. We only spread the reaction more quickly. Your trouble, Hofmeyer, is that you know no harm can result so long as the drive is cut within 9.54 seconds. You know it doesn't matter, as far as the safety of the ship is concerned, whether it's two seconds or 9.53. So, like an experienced operator in any other sphere, you want to work right to the limit. But remember all the unlikely things that can't be expected on

one trip, but might happen once in two hundred. The button sticks. If you've left three seconds, you've time to cut out the drive with the lever. Anything less, and that's the end of you and the ship."

Hofmeyer had sobered. "All right, Jeff. I know. But in my own defense, that's the first time since I left training school that I kept on drive until the bell rang. What I don't understand is, why do they leave it to human error? Why not make it impossible for the drive to be kept on more than nine seconds? It would be easy enough."

"There's several reasons, and the main one is that every pilot would then rely too much on the safety device. He couldn't help it. He'd know it no longer depended on him. Another reason is that in the end it's safer to trust human beings in a matter like this than machines. Clocks stop, relays wear, wires break or lose their insulation. Maybe you don't know it, but fifty years before you were born the kind of device you mention was tried out. The report was unfavorable. The machine didn't give the safety margin that a human being knowing what could happen does."

"Another thing—just for curiosity. And don't knock my head off if I should know the answer. Why use a button that has to be pushed twice? Wouldn't it be better if it had to be held down? Then if the captain suddenly dropped dead his finger would come off the button."

"There's more difference of opinion about that. The reason it's as is, is that it's supposed to be quicker pressing down than withdrawing pressure, physiologically."

"Well, isn't it?"

"Yes, but there's also the fact that when you press a button it has to go right in and make contact before it has any effect. If you're taking your finger off, contact is broken from the instant the button is allowed to move. But that's not the sort of thing that's likely to matter much. The main thing is simply that pilots must take care."

"All right, Jeff. I suppose I needed that. Are you going to report me?"

"Not if I have your promise—a personal promise to me, nothing to do with

the Spaceman's Code—that you'll take six seconds as your mark."

"It's done. I suppose, though you won't tell me about it, that even the 9.54 figure allows a certain margin of safety which you boys are keeping to yourselves?"

"It's a reasonable assumption," Bremner admitted. "But get this, Hofmeyer. Don't go thinking it's safe to wait for the bell, and then a bit. The margin's been made as small as it reasonably can be—for remember, no one wants to waste the drive. You can call the others back now."

Merson and McCall showed their quality by making no indication that they knew their captain had been on the carpet. They were a good trio, Bremner thought.

IT WENT ON being a nice trip, right to the moment when McCall had his first suspicion of the astrogation correlates. Merson and he were in the control-room with the Engineer at the time.

"Get them to run the whole thing again," Merson suggested. "They'll swear at you, particularly when the same figures come out again, but astrogators have things too easy anyway."

McCall looked at Bremner for permission to leave only the two of them in control. The Engineer nodded. He wasn't worried about the calculations. He had been in space a long time, and he could see nothing wrong with the course. They were cutting close to the sun to intercept the orbit of Venus, but they were at full velocity and looked as if they could be a lot closer without having to worry.

McCall was gone a long time. He brought Hofmeyer back with him. Merson and the Engineer looked up, disturbed now.

"I don't know whether we can get clear," said McCall grimly, "but we're going to have to try."

He explained what had happened, in detail. A junior astrogator had run the calculation. It had looked all right to the second astrogation officer, and he had passed it to his chief. The chief knew it was passed by two good men and that it was supposed to be checked by one of the senior officers. He looked at it, **did**

a neat little calculation in his head and was satisfied, thinking the disagreement was only what might be expected from his approximations, no more, no less.

"And I did the same," said Merson. "Probably got the same answer."

Hofmeyer cut out the automatic drive and eased the ship round—in six-second bursts, Bremner noticed. Then he went back to automatic. He had done all he could before they had worked out a new course.

They all worked on it independently, the three officers and the Engineer. Part of the blame was his. No authority said he had to check astrogation correlates—only that he should see that it was done. On perhaps fifty out of a hundred and fifty or so trips, long and short, he had worked the whole thing out, painstakingly, without calculators. He had never found a tenth-place decimal mistake. Once he thought he had, and an astrogator, concealing his glee, had demonstrated the error in his mathematics.

Hofmeyer consulted charts and passed them on to the others. He got his result first, and waited patiently while the others completed their calculations.

They coincided exactly. The ship was too close to the sun already. To turn it further than Hofmeyer had done would give the sun a greater pull. What they wanted was more power to put into the existing curve. And they didn't have it. The vibrodrive could be operated to give them over nine seconds at a time, and with a glance at the Engineer, Hofmeyer proceeded to do just that, waiting deliberately each time after the bell rang for what seemed an interminable time. But it was still not enough.

Bremner looked at the three of them. "Leave me," he said. "I'll take over."

"We can't," Hofmeyer remarked quietly.

An Engineer had power of life and death, but no individual, not even an Engineer, could be left in sole control. Bremner thought of argument, but it would take too long.

"Very well," he said. "Leave me with McCall."

There was nothing to show the thought behind that, the fact that the instant be-

fore he spoke he had not known whether he had been about to say Hofmeyer, Merson or McCall.

MERSON and Hofmeyer didn't argue. The Engineer must have some plan, and the longer they waited the less likely it would be to be effective. Silently, they left.

"Take over," said Bremner. "Switch on."

The drive was silent. There were scores of warning devices to show that it was on, but only the lights and buzzers and dials showed it. McCall watched them and waited well over nine seconds. Space officers got so that they didn't need clocks for anything up to ten seconds. They could feel when the drive had to go off, with increasing urgency as 9.54 approached. Hofmeyer was good, but in emergency McCall was little behind him. When he moved his finger at least 9.3 seconds had elapsed.

"No!" exclaimed Bremner. "Leave it!"

Habit was too strong. McCall cut the drive as usual.

"Put it on and leave it," said the Engineer.

McCall looked at him to make sure he had not suddenly gone mad, and did as he was told.

"There's a very big safety margin, then," he murmured. The drive went on for ten seconds, twenty seconds, a minute.

"The whole thing is safety margin," said Bremner. "It's strange how easy it is to get a white lie accepted as plain truth. There's one in psychology too—know it? Everyone knows no one can be hypnotized into doing something his conscious mind abhors—psychologists teach it. And it's simply not true. My theory, though I haven't looked into history to check it, is that some early psychologist, Janet or Charcot, maybe, saw that hypnosis was liable to be outlawed. So he invented that—safety margin, if you like. Everybody believed it, because it was a nice thing to believe. And whenever it occurred to anyone that there ought to be strict control of hypnosis, someone was sure to say, 'But no one can be hypnotized

into . . .? And everyone relaxed."

"You mean the vibrodrive can be used . . . indefinitely?" McCall asked. "There's no chain reaction?" His face showed the effort it took to believe it. If you believe for forty years that petrol is inflammable, it is a shock when you learn at last that petrol won't burn under any circumstances. "But the ships that have been lost . . .?"

"Some of them never existed. We created them on paper, as necessary reminders. The rest disappeared for other reasons, some of which we don't know; but it was convenient to put them all down to the same cause. We were grateful for these losses, in a way. Sooner or later someone would realize that no one had ever known a spaceman who was lost, if we relied solely on the paper losses. But when every loss was put down to carelessness with the vibrodrive, every spaceman knew someone who had died in a blowup."

"But why?"

BREMNER was studying the dials on the board. "You'd only have to think for a moment to see that." The extra power had done the job. Bremner sighed. "The vibrodrive is the most terrible weapon ever invented—if it can be used continuously and if there's no limit to the power that can be put into it. Think of it. A fort could be made the armature in a drive that's no drive. It goes on and on, hour after hour. And no one knows anything about it until the fort itself begins to spin. Or a directional drive can be set to an area on a planet maybe a thousand miles square. The force isn't strong enough to move a thing in the area—but after a while storms disrupt it and gales bring everything to a standstill. Or if you really want to start something, you turn your drive on the sun. Or tune it to a thought waveband. You can stop all radio communication, kill thousands at a time, and there's no defense."

Bremner fixed the second engineer with a significant gaze. "And remember," he

said softly, "that these are only the things anyone can think of offhand, without really trying. What uses, could be discovered for the vibrodrive as a weapon in war are beyond all our imaginings.

"So, long ago, scientists and governments got together. They couldn't stop or outlaw the drive. Too many people knew too much about it by that time. All they could do was create a fairy story that might save civilization until it knew better. They had to blow up a few ships then, sacrifices to the good of the greatest number. But they got this myth established. They fixed things so that anyone who started experimenting with the idea that there need be no chain reaction would be betrayed at once, not by high-minded men who cared for the future of humanity, but by any man who wanted to keep his own skin whole. And it's worked."

McCall darted a glance at him, suddenly uneasy. "But you must keep this secret," he muttered.

Bremner smiled. He answered the unspoken question obliquely. "I might get you made an Engineer," he said softly. "There's always that out."

McCall sighed with relief.

"You can cut the drive now," said Bremner.

It had been a hard decision. Hofmeyer—careless, lucky, easy-going. Merson—reliable up to a point, and then utterly irresponsible. McCall—disappointed but not soured, trustworthy but not brilliant.

Bremner watched McCall at the control board, and then suddenly moved. McCall slumped over the board, and the Engineer put the little flat gun back in his pocket.

Yes, it had been a hard decision. It was hardly just that McCall should have to die for the error of others, partly Bremner's own. But life seldom was just. He moved to the door. McCall would be stated to have died from heart failure, and the doctor's examination would show, just that.

"Hofmeyer—Merson," he called. "I'm afraid something has happened to McCall."