Off the Beam

By GEORGE O. SMITH

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Thirty hours out of Mars for Terra, the *Solar Queen* sped along her silent, invisible course. No longer was she completely severed from all connection with the planets of the inner system; the trick cams that controlled the beams at Venus Equilateral kept the ship centered by sheer mathematics. It was a poor communications system, however, since it was but a one-way job. Any message-answering would have to be done thirty hours later when the ship made planetfall, and the regular terminal office of Interplanetary Communications could be employed.

In spite of her thirty hours at 2-G, which brought her velocity to eleven hundred miles per second, the beam-director cams did their job well enough. It was only in extreme cases of course-changing to dodge meteors that the beams lost the ship; since the cams were not clairvoyant, there was no way to know when the autopilot juggled the controls to miss a bit of cosmic dust. The cams continued to spear the space through which the ship was supposed to pass according to the course constants.

What made this trip ironic was the fact that Don Channing was aboard. The beams had been bombarding the *Solar Queen* continually ever since she left Mars with messages for the Director of Communications. In one sense, it seemed funny that Channing was for once on the end of a communications line where people could talk to him but upon which he could not talk back. On the other hand it was a blessing in disguise, for the Director of

Communications was beginning to paper-talk himself into some means of contacting the Relay Station from a spaceship.

A steward found Channing in the salon and handed him a 'gram. Channing smiled, and the steward returned the smile and added: "You'll fix these ships to talk back one day. Wait until you read that one—you'll burn from here to Terra!"

"Reading my mail?" asked Channing cheerfully. The average spacegram was about as secret as a postcard, so Channing didn't mind. He turned the page over and read:

> HOPE YOU'RE WELL FILLED WITH GRAVANOL AND ADHESIVE TAPE FOR YOUR JUMP FROM TERRA TO STATION. SHALL TAKE GREAT DELIGHT IN RIPPING ADHESIVE TAPE OFF YOUR MEASLY BODY. LOVE.
>
> ARDEN

"She will, too," grinned Don. "Well, I'd like to toss her one back, but she's got me there. I'll just fortify myself at the bar and think up a few choice ones for when we hit Mojave."

"Some day you'll be able to answer those," promised the steward. "Mind telling me why it's so tough?"

"Not at all," smiled Channing. "The problem is about the same as encountered by the old-time cowboy. It's a lot easier to hit a man on a moving horse from a nice, solid rock than it is to hit a man on a nice, solid rock from a moving horse. Venus Equilateral is quite solid as things go. But a spaceship's course is fierce. We're wobbling a few milliseconds here and a few there, and by the time

you use that arc to swing a line of a hundred million miles, you're squirting quite a bit of sky. We're tinkering with it right now, but so far we have come up with nothing. Ah, well, since the human race got along without electric lights for a few million years, we can afford to tinker with an idea for a few months. Nobody is losing lives or sleep because we can't talk to the boys back home."

"We've been hopping from planet to planet for quite a number of years too," said the steward. "Quite a lot of them went by before it was even possible to contact a ship in space."

"And that was done because of an emergency. Probably this other thing will go on until we hit an emergency; then we shall prove that old statement about a loaf of bread being the maternal parent of a locomotive." Channing lit a cigarette, and puffed deeply. "Where do we stand?"

"Thirty hours out," answered the steward. "About ready for turnover. I imagine that the poor engineer's gang is changing cathodes about now."

"It's a long drag," said Channing. He addressed himself to his glass and began to think of a suitable answer for his wife's latest thrust.

Bill Hadley, of the power engineer's gang, spoke to the pilot's greenhouse below the ship. "Hadley to pilot room: Cathodes 1 and 3 ready."

"Pilot Greenland to Engineer Hadley: Power fade-over from even to odd now under way. Tubes 2 and 4 now dead; load on 1 and 3. You may enter 2 and 4."

"Check!"

Hadley cracked an air valve beside a circular air door. The hiss of entering air crescendoed and died, and then Hadley cracked the door that opened in upon the huge driver tube. With casual disregard for the annular electrodes that filled the tube and the sudden death that would come if the pilot sent the driving voltages surging into the electrodes, Hadley climbed to the top of the tube and used a spanner to remove four huge bolts. A handy differential pulley permitted him to lower the near-exhausted cathode from the girders to the air door where it was hauled to the deck. A fresh cathode was slung to the pulley and hoisted to place. Hadley bolted it tight and clambered back into the ship. He closed the air door and the valve, and then opened the valve that led from the tube to outer space. The tube evacuated and Hadley spoke once more to the pilot room.

"Hadley to Greenland: Tube 4 ready."

"Check."

The operation was repeated on Tube 2, and then Pilot Greenland said: "Fade-back beginning. Power diminishing on 1 and 3, increasing on 2 and 4. Power equalized, acceleration 2-G as before. Deviation from norm: two-tenths-G."

Hadley grinned at the crew. "You'd think that Greenland did all that himself, the way he talks. If it weren't for autopilots, we'd have been all over the sky."

Tom Bennington laughed. He was an old-timer, and he said in a reminiscent tone: "I remember when we used to do that on manual. There were as many cases of *mal de void* during cathode change as during turnover. Autopilots are the nuts—look! We're about to swing right now, and I'll bet a fiver that the folks below won't know a thing about it."

A coincidence of mammoth proportions occurred at precisely that instant. It was a probability that made the chance of drawing a royal flush look like the chances of tomorrow coming on time. It was, in fact, one of those things that they said couldn't possibly happen, which went to prove only how wrong they were. It hadn't happened yet and probably wouldn't happen again for a million million years, but it did happen once.

Turnover was about to start. A relay circuit that coupled the meteor-spotter to the autopilot froze for a bare instant, and the coincidence happened between the freezing of the relay contacts and the closing of another relay whose purpose it was to shunt the coupler circuits through another line in case of relay failure. In the

inconceivable short time between the failure and the device that corrected failure, the *Solar Queen* hit a meteor head on.

It is of such coincidences that great tragedies and great victories are born.

The meteor, a small one as cosmic objects go, passed in through the broad observation dome at the top of the ship. Unhampered, it zipped through the central well of the *Solar Queen* and passed out through the pilot's greenhouse at the bottom of the ship. Its speed was nothing worth noting; a scant twenty miles per second almost sunward. But the eleven hundred miles per second of the *Solar Queen* made the passage of the meteor through the six hundred feet of the ship's length of less duration than the fastest camera shutter.

In those microseconds, the meteor did much damage.

It passed through the main pilotroom cable and scrambled those circuits which it did not break entirely. It tore the elevator system from its moorings. It entered as a small hole in the observation dome and left taking the entire pilot's greenhouse and all of the complex paraphernalia with it.

The lines to the driver tubes were scrambled, and the ship shuddered and drove forward at 10-G. An inertia switch tried to function, but the resetting solenoid had become shorted across the main battery and the weight could not drop.

Air doors clanged shut, closing the central well from the rest of the ship and effectively sealing the well from the crew.

The lights in the ship flickered and died. The cable's shorted lines grew hot and fire crept along its length and threatened the continuity. The heat opened fire-quenching vents and a cloud of

CO_2, emerged together with some of the liquid gas itself. The gas quenched the fire and the cold liquid cooled the cable. Fuses blew in the shorted circuits—

And the *Solar Queen* continued to plunge on and on at 10-G; the maximum possible out of her driving system.

The only man who remained aware of himself aboard the *Solar Queen* was the man who was filled with gravanol and adhesive tape. No other person expected to be hammered down by high acceleration. Only Channing, who was planning to leave Terra in his own little scooter, was prepared to withstand high G. He, with his characteristic hate of doing anything slowly, was ready to make the Terra to Venus Equilateral passage at 5- or 6-G.

It might as well have caught him, too. With all of the rest unconscious, hurt, or dead, he was alone and firmly fastened to the floor of the salon under eighteen hundred pounds of his own, helpless weight.

And as the hours passed, the *Solar Queen* was driving farther and farther from the imaginary spot that was the focus of the communicator beams from Venus Equilateral.

The newly-replaced cathodes in the driving tubes were capable of driving the ship for about two hundred G-hours at 1-G, before exhaustion to the point of necessary replacement for safety purposes. The proportion is not linear, nor is it a square-law, but roughly it lies in the region just above linear, so that the *Solar Queen* drove on and on through space for ten hours at 10-G before the cathodes died for want of emitting surface. They died, not at once, but in irregular succession so that when the last erg of power was gone from the ship it was zooming on a straight line tangent

from its point of collision but rolling in a wild gyration through the void.

And twenty-five hundred miles per second added to her initial velocity of eleven hundred miles per second added up to thirty-six hundred miles per second. She should have had about seventy-five million miles to go at 2-G, to reach Terra in thirty hours from the halfway point where she turned ends to go into deceleration. Instead, the *Solar Queen* after ten hours of misdirected 10-G acceleration was thirty million miles on her way, or about halfway to Terra. Three hours later, driving free, the *Solar Queen* was passing Terra, having missed the planet by a few million miles.

Back in space, at an imaginary junction between the beams from Venus Equilateral and the course registered for the *Solar Queen*, Arden Channing's latest message was indicating all sorts of mild punishment for her husband when she got him home.

By the time that the *Solar Queen* should have been dropping out of the sky at Mojave Spaceport, the ship would be one hundred and ninety million miles beyond Terra and flirting with the imaginary line that marked the orbit of Mars.

That would be in seventeen hours.

Weightless, Channing pursued a crazy course in the salon of the spinning ship. He ached all over from the pressure, but the gravanol had kept his head clear and the adhesive tape had kept his body intact. He squirmed around in the dimness and could see the inert figures of the rest of the people who had occupied the salon at the time of the mishap. He became sick. Violence was not a part of Channing's nature—at least he confined his violence to those against whom he required defense. But he knew that many of those

people who pursued aimless orbits in the midair of the salon with him would never set foot on solidness again.

He wondered how many broken bones there were among those who had lived through the ordeal. He wondered if the medical staff of one doctor and two nurses could cope with it.

Then he wondered what difference it made if they were to go on and on, and from that thought came the one he should have thought of first: How were they to stop going on and on? Channing had a rough idea of what had happened. He knew something about the conditions under which they had been traveling, how long, and in which direction. It staggered him, the figures he calculated in his mind. It behooved him to do something.

He bumped an inert figure, and grabbed. One hand took the back of the head and came away wet and sticky. Channing retched, and then threw the inert man from him. He coasted back against a wall, and caught a handrail. Hand-over-hand he went to the door and into the hall. Down the hall he went to the passengers' elevator shaft and with no thought of what his action would have been on any planet, Channing opened the door and drove down the shaft for several decks. He emerged and headed for the sick ward.

He found the doctor clinging to his operating table with his knees and applying a bandage to one of his nurses' heads.

"Hello, Doc," said Channing. "Help?"

"Grab Jen's feet and hold her down," snapped the doctor.

"Bad?" asked Don as he caught the flailing feet.

"Seven stitches, no fracture," said the doctor.

"How's the other one?"

"Unconscious, but unharmed. Both asleep in bed, thank God. So was I. Where were—? You're Channing and were all doped up with gravanol and adhesive. Thank yourself a god for that, too. I'm going to need both of my nurses and we'll all need you."

"Hope I can do some good," said Don.

"You'd better. Or any good I can do will be wasted. Better start right now. Here," the doctor produced a set of keys, "these will unlock anything in the ship but the purser's safe. You'll need 'em. Now get along and do something and leave the body-mending to me. Scram!"

"Can you make out all right?"

"As best I can. But you're needed to get us help. If you can't, no man in the Solar System can. You're in the position of a man who can not afford to help in succoring the wounded and dying. It'll be tough, but there it is. Get cutting. And for Heaven's sake, get us two things: Light and a floor. I couldn't do more than slap on tape whilst floating in air. See you later, Channing, and good luck."

The nurse squirmed, groaned, and opened her eyes. "What happened?" she asked, blinking into the doctor's flashlight.

"Tell you later, Jen. Get Fern out of her coma in the ward and then we'll map out a plan. Channing, get out of here!"

Channing got after borrowing a spare flashlight from the doctor.

He found Hadley up in the instrument room with a half dozen of his men. They were a mass of minor and major cuts and injuries, and were working under a single incandescent lamp that had been

wired to the battery direct by means of spare cable. The wire went snaking through the air in a foolish, crooked line, suspended on nothing. Hadley's gang were applying first aid to one another and cursing the lack of gravity.

"Help?" said Channing.

"Need it or offer it?" asked Hadley with a smile.

"Offer it. You'll need it."

"You can say that again—and then pitch in. You're Channing, of Communications, aren't you? We're going to have a mad scramble on the main circuits of this tub before we can unwind it. I don't think there's an instrument working in the whole ship."

"You can't unravel the whole works, can you?"

"Won't try. About all we can do is replace the lighting system and hang the dead cathodes in again. They'll be all right to take us out of this cockeyed skew-curve and probably will last long enough to keep a half-G floor under us for tinkering, for maybe forty or fifty hours. Assistant Pilot Darlange will have to learn how to run a ship by the seat of his pants—as far as I can guess there isn't even a splinter of glass left in the pilot room—so he'll have to correct this flight by feel and by using a haywire panel."

"Darlange is a school-pilot," grinned one of Hadley's men.

"I know, Jimmy, but I've seen him work on a bum autopilot, and he can handle haywire all right. It'll be tough without Greenland, but Greenland—" Hadley let the sentence fall; there was no need to mention the fact that Greenland was probably back there with the rest of the wreckage torn from the *Solar Queen*.

Jimmy nodded, and the action shook him from his position. He grabbed at a roll of tape that was floating near him and let it go with a laugh as he realized it was too light to do him any good.

"Too bad that this gyration is not enough to make a decent gravity at the ends, at least," snorted Hadley. He hooked Jimmy by an arm and hauled the man back to a place beside him. "Now look," he said, "I can't possibly guess how many people are still in working condition after this. Aside from our taped and doped friend here, the only ones I have are we who were snoozing in our beds when the crush came. I'll bet a cooky that the rest of the crowd are all nursing busted ribs, and worse. Lucky that full-G died slowly as the cathodes went out; otherwise we'd all have been tossed against the ceilings with bad effects.

"Jimmy, you're a committee of one to roam the crate and make a list of everyone who is still in the running and those who can be given minor repairs to make them fit for limited work. Doc has a pretty good supply of Stader splints; inform him that these are only to be used on men who can be useful with them. The rest will have to take to plaster casts and the old-fashioned kind of fracture-support.

"Pete, you get to the executive deck and tell Captain Johannson that we're on the job and about to make with repairs. As power engineer, I've control of the maintenance gang too, and we'll collect the whole, hale, and hearty of Michaels' crew on our merry way.

"Tom, take three of your men and begin to unravel the mess with an eye toward getting us lights.

"Tony, you can do this alone since we have no weight. You get the stale cathodes from the supply hold and hang 'em back in the tubes.

"Channing, until we get a stable place, you couldn't do a thing about trying to get help, so I suggest that you pitch in with Bennington, there, and help unscramble the wiring. You're a circuit man, and though power-line stuff is not your forte, you'll find that running a lighting circuit is a lot easier than neutralizing a microwave transmitter. Once we get light, you can help us haywire a control panel. Right?"

"Right. And as far as contacting the folks back home goes, we couldn't do a darned thing until the time comes when we should be dropping in on Mojave. They won't be looking for anything from us until we're reported missing; then I imagine that Walt Franks will have everything from a spinthariscope to a gold-foil electroscope set up. Right now I'm stumped, but we have seventeen hours before we can start hoping to be detected. Tom, where do we begin?"

Bennington smiled inwardly. To have Don Channing asking him for orders was like having Captain Johannson request the batteryman's permission to change course. "If you can find and remove the place where the shorted line is, and then splice the lighting circuits again, we'll have a big hunk of our work done. The rest of us will begin to take lines off of the pilot's circuits right here in the instrument room so that our jury-controls can be hooked in. You'll need a suit, I think, because I'll bet a hat that the shorted line is in the well."

For the next five hours, the instrument room became a beehive of activity. Men began coming in driblets, and were put to work as

they came. The weightlessness gave quite a bit of trouble; had the instrument panels been electrically hot, it would have been downright dangerous since it was impossible to do any kind of work without periodically coming against bare connections. Tools floated around the room in profusion, and finally Hadley appointed one man to do nothing but roam the place to retrieve "dropped" tools. The soldering operations were particularly vicious, since the instinctive act of flinging excess solder from the tip of an iron made droplets of hot solder go zipping around the room to splash against something, after which the splashes would continue to float.

Men who came in seeking to give aid were handed tools and told to do this or that, and the problem of explaining how to free a frozen relay to unskilled help was terrific.

Then at the end of five hours, Channing came floating in to the instrument room. He flipped off the helmet and said to Hadley: "Make with the main switch. I think I've got it."

Throughout the ship the lights blinked on.

With the coming of light, there came hope also. Men took a figurative hitch in their belts and went to work with renewed vigor. It seemed as though everything came to a head at about this time, too. Hadley informed Darlange that his jury-control was rigged and ready for action, and about the same time, the galley crew came in with slender-necked bottles of coffee and rolls.

"It was a job, making coffee," grinned the steward. "The darned stuff wanted to get out of the can and go roaming all over the place. There isn't a one of us that hasn't got a hot coffee scar on us somewhere. Now if he"—nodding at Darlange—"can get this thing straightened out, we'll have a real dinner."

"Hear that, Al? All that stands between us and dinner is you. Make with the ship-straightening. Then we'll all sit around and wait for Channing to think."

"Is the ship's communicator in working order?" asked Darlange.

"Sure. That went on with the lights."

Darlange called for everyone in the ship to hold himself down, and then he tied his belt to the frame in front of the haywired panel. He opened the power on drivers 1 and 2, and the ship's floor surged ever so little.

"How're you going to know?" asked Hadley.

"I've got one eye on the gyro-compass," said Darlange. "When it stops turning, we're going straight. Then all we have to do is to set our bottom end along the line of flight and pack on the decel. Might as well do it that way since every MPS we can lose is to our advantage."

He snapped switches that added power to Driver 3. Gradually the gyro-compass changed from a complex rotation-progression to a simpler pattern, and eventually the simple pattern died, leaving but one freedom of rotation. "I'm sort of stumped," grinned Darlange. "We're now hopping along, but rotating on our long axis. How we stop axial rotation with drivers set parallel to that axis I'll never guess."

"Is there a lifeship in working order?" asked Hadley.

"Sure."

"Tom, turn it against the rotation and apply the drivers on that until we tell you to stop."

An hour later the ship had ceased to turn. Then Darlange jockeyed the big ship around so that the bottom was along the line of flight. Then he set the power for a half-G, and everyone relaxed.

Ten minutes later Captain Johannson came in.

"You've done a fine job," he told Hadley. "And now I declare an hour off for dinner. Dr. MacLain has got a working medical center with the aid of a few people who understand how such things work, and the percentage of broken bones, though terrific in number, is being taken care of. The passengers were pretty restive at first, but the coming of light seemed to work wonders. This first glimmer of power is another. About nine or ten who were able to do so were having severe cases of skysickness." He smiled ruefully. "I'm not too sure that I like no-weight myself."

"Have you been in the observation dome?" asked Don.

"Yes. It's pierced, you know."

"Did the meteor hit the telescope?"

"No, why?"

"Because I'm going to have to get a sight on Venus Equilateral before we can do anything. We'll have to beam them something, but I don't know what right now."

"Can we discuss that over a dinner?" asked the captain. "I'm starved, and I think that the rest of this gang is also."

"You're a man after my own heart," laughed Channing. "The bunch out at the Station wouldn't believe me if I claimed to have done anything without drawing it up on a tablecloth."