

CRITICAL ANGLE

We were lucky to escape with our lives and for that reason, I suppose, we have no real cause for complaint. All the same, it hurts, this being regarded as vandals by the very people who should be most grateful to us. And it's not only the astronomers who have it in for us — every third rate versifier who ever wrote slushy lyrics for popular songs hates our guts; and if it ever does come to a shooting war with the Soviet Union, and we lose, I rather fear that Hank and I will head the list of American citizens to be liquidated without delay.

It was all far too much of a rush job, of course. There should have been rockets round the Moon, unmanned and manned. There should have been unmanned rockets landing on the Moon. The much advertised telemetering equipment should have been given a real work-out. But politics — and international politics at that — got all tangled up with honest astronautics, and our scientists just had to do something really spectacular to save face.

They did.

Or we did.

And we got blamed.

It was the business of the Red Moon that started things off. The Russian rocket, you will remember, was unmanned and carried as payload a few tons of bright scarlet powder. It was fitted with a proximity fuse, and had a demolition charge which would not only destroy the rocket but spread the powder over a large area of the Moon's face.

It worked all right.

There was no advance publicity. There were unconfirmed press reports of beeps on the twenty megacycle band apparently heading Moonward. These were taken with a large grain of salt; everybody remembered the panic started by similar rumors in the past. And then, of course, there came the night of a full Moon when it was obvious to all the world that the Russians had done it. The red stain was big enough to be seen with the naked eye. It even—although this may have been due more to chance than to skill — looked like a Red Star.

So there it was, covering Copernicus and more, the glaring proof that the Russians had beaten us to it again. We of the Rocket Service had this to say about it—if we had been in existence earlier it wouldn't have happened. It was the Army's fault, the Navy's fault, or the fault of the Air Force. Now that we were the only body concerned with astronautics, we should, in time, catch up.

In time ...

That was the snag.

The Press demanded action now, if not before. Congress was unanimous in demanding to know just what we had done and were doing with our appropriations. The General was called to the White House for a stormy

interview.

On his return he sent for Hank Williams and myself. We weren't as worried as we might have been when we received the summons. Generals don't bawl out lowly Lieutenants in person — besides, we had clear consciences.

Old Back Blast was sitting behind his desk when we were ushered into the presence. He did not get to his feet—even so, his eyes were on a level with ours. "Sit down!" he barked. We sat down. "H'm!" he grunted. "Perhaps you'd better stand. I don't feel that I should look down on you."

"Why shouldn't you, sir?" asked Hank. "After all, you're a General, and we're only Lieutenants."

"After all," said Back Blast, looking at us with an odd sort of expression, "I'm only a General, and you're the first men in the Moon."

"Five hundred miles straight up," said Hank, "doesn't make us the first men in the Moon."

"Don't argue!" roared the General. "If I say that you're the first men in the Moon, then you are. Or you will be."

"Unless the Russians—" I began to say.

"Damn the Russians. Look men, I'm offering you a chance that I'd sell my own soul for. But I'm too old and too big and too heavy. I'm offering you the chance, you're the best two pilots I've got. Inside a week we can have MR-1 stripped of all her electronic gadgets and fitted out to carry a two man crew. Inside two weeks you can be planting the flag bang in the middle of that sanguinary red star."

"But the Russians — "

"I happen to know," he said coldly, "that the Russians are going about this according to all the rules. Their next step will be a rocket round the Moon with telemetering equipment, cameras and the usual hapless hound. After that there'll be a manned rocket round the Moon. After that, perhaps, a landing. That's what we should be doing. But I'm convinced that MR-1 can make it, and with ample propellant for the return journey."

I looked at Hank and he looked at me. We both looked at Back Blast Bradley. He looked back at us.

"Well?" he asked. "Are you in it, or do I get Ferranti and Smith for the job?"

"We're in it," we said together.

Six days wasn't long for all we had to do. We told ourselves that the Wright brothers had flown without either theory or data on the principles of heavier than air flight to help them. We told ourselves that we had books full of theory and enough data to take us in safety (perhaps) to Mars and beyond. But we knew that there should have been far more data, and that this data should have been collected by MR-1, the first of the circumlunar telemetering ships. This data we would have to get the hard way. On the

morning of the sixth day we went out to the field.

MR-1 was there. She was a big brute, as three stage rockets have to be. She made us feel very small. She made even the General look small. She was big enough looking at her from the outside, but our cabin would have been condemned by the R.S.P.C.A. had it been intended for the accommodation of two miniature poodles.

We were sealed in while the count down was underway. We sat there glumly. We should have been feeling elated, but we weren't. It was like sitting in an unusually cramped dentist's waiting room, waiting for the summons to the chair.

The count down finished. Hank shrugged his shoulders. He looked at me. I looked at him. I saw that his foot rested on the firing pedal. I saw the foot stamp down. Our chairs tipped backwards and held us. In spite of the soundproofing we were deafened by the roar of the rockets. In spite of our previous experience of acceleration we felt that our flattened guts would never again resume either their proper shapes or locations.

There was a brief respite when the first stage cut out—all this part of it, of course, was entirely automatic — and another when we dropped the second stage. It was a great relief when the motors of the third stage ceased firing. Free fall is a pleasant sensation if you have the right psychological make-up. It's far pleasanter than five gee acceleration, no matter what psychological make-up you have.

We released ourselves from our chairs and took observations. Earth was below us, as we had seen her so often during our flights outside the atmosphere. The Moan was to one side of our course. I must confess that I had the panicky feeling that we were going to miss her and fall forever through empty Space. I knew that we were heading for where the Moon would be when we got there, but knowing a thing and feeling it aren't the same.

After the first wonderment had worn off we began to feel very blasé about the whole business. We just couldn't see why there should be all this fuss about a voyage to the Moon. It was no more than a straightforward problem in ballistics, and the target was so big that it was practically impossible to miss it. When we came to the turnover point the gyroscopes functioned perfectly. Deceleration was commenced on time, and the indications were that we should have ample propellant for all our requirements.

Below us the Moon swelled with every passing hour. At two hundred miles up it was still a sphere, but a huge one. At one hundred miles it was a vast plain with pronouncedly curved horizons. At fifty miles the red star over Copernicus was not so perfect as it appeared from Earth. The five arms of it were of unequal lengths, and ragged. But it was still impressive.

Then there wasn't much time for sightseeing. We were dropping slowly, I suppose, but it seemed far too fast. It seemed that the Moon was coming up to hit us — the pockmarked plain with that huge, gaudy, blotchy red star, the sheer cliffs and jagged mountains, the dark, dark shadows. Then the crater rim was above us, sharp against the black sky.

We touched.

It was not the hard shock that we were anticipating. It was like landing on a pile of feathers. Hank cursed and cut the drive. He cursed again as our descent continued. A grey tide, deepening to blackness, washed up over the control room viewports.

I said, "I'm only the navigator, but don't you think you should get us out of here?"

He replied, with elaborate courtesy, "There's nothing I'd like better, old man. But it should be obvious, even to the navigator, that every venturi will be well choked by now, and that firing the rockets will, at the very least, blow our stern off."

"Choked?" I asked stupidly. "What with?"

"Not orange blossoms," he told me. "Nor rose petals. Dust. Some kind of dust. Maybe powdered rock, maybe metal. Don't ask me how it got here, but we must have landed right in the middle of a deep drift of the stuff."

"How do we get out?"

"That," he said, "is the sixty-four-thousand-dollar question."

We decided, then, to break out the bottle of brandy that we had brought along with us to toast our safe arrival on the Moon. We each had a stiff slug. We each had a second one. Reluctantly we put the bottle away.

We climbed into our spacesuits — and that part of it is easier in the writing than it was in the doing. As I've said already, our cabin was compact. It would have been hard enough for one man to struggle into a raincoat. The way we finally worked it, I had to curl up on the deck while Hank dressed, and he did the same while I got suited up.

Hank went into the airlock. I heard the pump start, saw the needle of the pressure gauge dropping. I saw the Open sign flash on the outer door indicator. I heard his voice, weak and distorted from my helmet phone.

"Like I said, it's dust. Luckily it's very light and fluffy. I've managed to get a space cleared round the door. Shut it again, and then come into the airlock yourself."

I did as he said. I waited until the pressure inside the airlock had built up, then clambered into it. I started the evacuation pump again. I opened the outer door.

Hank was outside, lying supine, arms and legs spread wide, in what looked like a small cave. I thought at first that something had happened to him. I was about to rush outside to his assistance when he stopped me.

"Don't make any fast moves!" he snapped, "or you'll bring the whole damned issue down on top of me!"

"Are you hurt?" I asked.

"No. But if I weren't lying like this I'd be neck deep in the infernal stuff by now. Stay where you are—we can talk just as well without your coming right outside.

"Now, Bill, this is the way that I've doped it out. We'll have to strip the ship of every non-essential piece of shielding or fairing. We shall want it all to line the sides of the shaft we're going to sink down to the stern and under the stern. We shall have to clear the jets, and make sure that there's a sufficiently large pit under them to take care of the back blast —"

"I didn't come all this way to be a miner," I said.

"Nor did I. But if we don't turn miners this will rank as one of the major disasters in American rocketry."

There was no arguing with that, so I went back inside the ship. After a short while he followed me.

We were amazed how much sheathing we were able to do without. It is quite remarkable how even when the saving of weight is the prime consideration the urge to make things look pretty — or neat — still persists. Safety comes into it too, of course. There is a lot to be said in favour of protective covering over wiring and plumbing.

What followed was hard work, and far from pleasant. Working by the light of our helmet lamps we sank the shaft along the ship's side, down to the stern. We dug a large pit under the exhausts, packing the fine, fluffy dust at its sides. Working in spells, and still far from happy about the prospects of radiation poisoning, we cleared the jets. It was after we were finished that we realized that we were standing on solid rock. This rather surprised us—we were beginning to think that the Moon was no more than a huge dust ball. We found, too, that the violently expanding vapours of the back blast would be diverted into a tunnel that ran down from the solid surface at a slight angle.

At last, dog-tired and soaked in perspiration, we climbed back to the airlock. I let Hank go in first, but as I waited outside, my feet against the side of the ship and my back against the wall of the shaft, I felt that it was a great mistake that MR-1 hadn't been given an airlock capable of handling two people at once. There was so much dust outside, and a sharp movement on my part could so easily bring it all tumbling down to bury me.

The airlock door opened, and with great relief I tumbled into the tiny compartment. A few minutes later I was sitting with Hank in the control room.

We had some more brandy.

"The trouble," he said, "is that there's a certain amount of cohesion about the stuff. It may pack tight ahead of us as we try to blast out . . ."

"It behaves almost like wet sand," I said, "which it shouldn't."

"Of course," he pointed out, "we have to remember that the critical angle is

different here from what it is on earth."

"The critical angle?" I asked.

"Yes. Or the angle of repose, if you'd rather call it that. It's a result of two forces — friction and gravity. You make a pile of, say, sand — and it will always fall into a cone of the same shape. You make a pile of coal, or bulk grain, and the angle of repose will always be the same for those two."

"It must be different on the Moon," I said.

"Damn right it's different ..." He paused. "Talking about it won't get us anywhere."

"No. And we'd better show our noses — otherwise poor old Back Blast Bradley will be adding to his fine collection of ulcers."

"It'll be his own fault if he does," said Hank. "He should have given us radio. That's the worst of these rush jobs."

We finished the brandy, and gave it a try. We sat in our chairs, praying hard, while the ship lurched and shuddered, straining every seam. It was impossible for us to tell whether or not we were making progress through the dust—our acceleration was too slight to register on the gauge.

Then, abruptly, we broke through, and the glaring sunlight streamed through the ports. We lifted faster and faster and we looked down on an astounding scene.

As far as we could see, ring walls and mountain ranges, hummocks and hills were crumbling and sliding and splashing and falling. The Russians' red star was already buried by sweeping tides of dust . . . the entire surface of the Moon was swirling, and flattening.

And that is why there is no Man in the Moon anymore. That is why the Lunar Appenines and the Leibnitz Range are no more, and the Great Wall is gone. That is why the Moon is now an almost featureless bad, with all its old mystery and glamor a thing of the past.

Mountains of dust — that's what the mystery and glamor came from—that and the ring-walled craters. Mountains of dust, rearing high with a spurious, flimsy majesty, with a steepness that would be impossible on Earth, maintaining a precarious balance.

Our exhaust, roaring through the tunnels honeycombing the solid core, set up tremors and destroyed that tenuous stability.

And that's why nobody loves us any more — neither the astronomers, nor the public, nor the popular song writers.

Even so — I think that we should be entitled to a cut of the royalties from the latest effort. Have you heard it yet?

The Men Who Killed The Man In The Moon . . .