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TAKEOFF

By Cyril M. Kornbluth

Part One of Three Parts

NEW WORLDS
Science Fiction

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I.

Morning of a bureaucrat.

On the wall behind his desk Daniel Holland, general manager of the U.S. Atomic Energy Commission, had hung the following:

His diploma from Harvard Law, '39;

A photograph of himself shaking hands with his hero, the late David Lilienthal, first A.E.C. chairman;

His certificate of honorable active service in the Army of the United States as a first lieutenant, in the Judge Advocate General's Department, dated February 12, 1945;

A letter of commendation from the general counsel of the T.V.A., which included best wishes for his former assistant's success in the new and challenging field of public administration he was entering;

A diploma declaring in Latin that he was an honorary Doctor of Laws of the University of North Carolina as of June 15, 1956; A blowup of *The New Republic's* vitriolic paragraph on his "Bureaucracy versus the People" (New York, 1956);

A blowup of *Time* magazine's vitriolic paragraph on his "Red Tape Empires" (New York, 1957);

Signed photographs of heroes (Lilienthal, the late Senator McMahon); industrialists (Henry Kaiser, the late Charles E. Wilson of General Motors, Wilson Stuart of Western Aircraft, the late John B. Watson of International Business Machines); scientists (James B. Conant, J. Robert Oppenheimer); and politicians (Chief Justice Palmer, Senator John Marshall Butler of Maryland, ex-President Truman, ex-President Warren, President Douglas);

An extract from the January 27, 1947, hearings of the Senate half of the joint Senate-House Committee on Atomic Energy—held in connection with confirmation of the President's appointees to the A.E.C., particularly that of Lilienthal—which ran as follows:

Senator McKellar (to Mr. Lilienthal): *Did it not seem to you to be remarkable that in connection with experiments that have been carried on since the days of Alexander the Great, when he had his Macedonian*

In many countries of the world there are Interplanetary or Rocket Societies whose members, fired with Man's age-old dream of space flight, can do little more than plan on paper the vital statistics necessary for the first flight to the Moon. This story, second in last year's International Fantasy Award, tells of one such Society suddenly endowed with unlimited capital.

scientists trying to split the atom, the President of the United States would discharge General Groves, the discoverer of the greatest secret that the world has ever known, the greatest discovery, scientific discovery, that has ever been made, to turn the whole matter over to you: who never really knew, except from what you saw in the newspapers, that the Government was even thinking about atomic energy?

The Chairman: *Let us have it quiet please.*

Senator McKellar: *You are willing to admit, are you, that this secret, or the first history of it, dated from the time when Alexander the Great had his Macedonian scientists trying to make this discovery, and then Lucretius wrote a poem about it, about two thousand years ago? And everybody has been trying to discover it, or most scientists have been trying to discuss it, ever since. And do you not really think that General Groves, for having discovered it, is entitled to some little credit for it?*

"Read that," said Holland to his first caller of the morning. "Go on, read it."

James MacIlheny, Los Angeles insurance man and president of the American Society for Space Flight, gave him an inquiring look and slowly read the extract.

"I suppose," MacIlheny said at last, "your point is that you wouldn't be able to justify granting my request if Congress called you to account."

"Exactly. I'm a lawyer myself; I know how they think. Right-wrong, black-white, convicted-acquitted. Exactly why should A.E.C. 'co-operate and exchange information with' you people? If you're any good, we ought to hire you. If you aren't any good, we oughtn't to waste time on you."

"Are those your personal views, Mr. Holland?" asked MacIlheny, flushing.

Holland sighed. "My personal views are on the record in a couple of out-of-print books, a few magazine articles, and far too many congressional-hearing minutes. You didn't come here to discuss my personal views; you came for an answer to a question. The answer has got to be 'no'".

"I came on your invitation——" MacIlheny began angrily, and then he pulled himself together. "I'm not going to waste time losing my temper. I just want you to consider some facts. American Government rocket research is scattered all over hell——Army, Navy, Air Force, Bureau of Standards, Coast and Geodetic Survey, and God-alone-knows-where-else. You gentlemen don't let much news out, but obviously we're getting nowhere. We would have had a manned rocket on the moon ten years ago if we were! I'm speaking for some people who know the problem, a lot of them trained, technical men. We've got the drawings. We've had some of them for fifteen years! All that's needed is money and fuel, atomic fuel——"

Holland looked at his watch, and MacIlheny stopped in mid-flight. "I see it's not getting through," he said bitterly. "When the Russian or Argentine lunar guided missiles begin to fall on America you'll have a lot to be proud of, Mr. Holland." He started for the door. Before he was out, Holland's secretary was in, summoned by a buzzer.

"Let's hit the mail, Charlie," Holland said, lighting a cigarette and emptying his overflowing "in" basket on his desk.

Ryan's bid on the Missoula construction job. "Tell him very firmly that I want him to get the contract because of his experience, but that his bid's ridiculously high. Scare him a little."

Damages claim from an ex-A.E.C. employee's lawyer, alleging loss of virility from radiation exposure. "Tell Morton to write this shyster absolutely nothing doing; it's utterly ridiculous. Hint that we'll have him up before his state bar association if he pesters us any more. And follow through if he does!"

Dr. Mornay at Oak Ridge still wanted to publish his article arguing for employment of foreign-born scientific personnel in the A.E.C. "Write him a very nice letter. Say I've seriously considered his arguments but I still think publication would be a grave error on his part. See my previous letter for reasons and ask him just to consider what Senator Hoyt would make of his attitude."

The governor of Nevada wanted him to speak at a dam dedication. "Tell him no, I never speak, sorry."

Personnel report from Missoula Directed Ops. "Greenleaf's lost three more good men, damn it. Acknowledge his letter of transmittal—warm personal regards. And tell Weiss to look over the table of organization for a spot we can switch him to where he'll stay in grade but won't be a boss-man."

Half-year fiscal estimate from Holloway at Chalk River Liaison Group in Canada. "Acknowledge it but don't say yes or no. Make copies for Budget and Comptroller. Tell Weiss to ride them for an opinion but not to give them any idea whether I think it's high, low, or perfect. I want to know what *they* think by tomorrow afternoon."

Messenger query from the A.P. on Hoyt's speech in the Senate. "Tell them I haven't seen the text yet and haven't had a chance to check A.E.C. medical records against the Senator's allegations. Add that in my personal experience I've never met an alcoholic scientist and until I do I'll continue to doubt that there is any such animal. Put some jokes in it."

The retiring Regional Security and Intelligence Office agent in charge at Los Angeles wanted to know Holland's views on who should succeed him. Records of three senior agents attached. "Tell him Anheier looks like the best bet."

The Iranian ambassador, with an air of injured innocence, wanted to know why his country's exchange students had been barred even from nonrestricted A.E.C. facilities. "Tell him it was a State Department decision. Put in some kind of a dig so he'll know I know they started it with our kids. Clear it with State before I see it."

A rambling petition from the Reverend Oliver Townsend Warner, Omaha spellbinder. "I can't make head or tail of this. Tell Weiss to answer it some way or other. I don't want to see any more stuff from Warner; he may have a following but the man's a crank."

Recruiting programme report from Personnel Office. "Acknowledge this and tell them I'm not happy about it. Tell them I want on my desk next Monday morning some constructive ideas about roping better junior personnel in, and keeping them with us. Tell them it's perfectly plain that we're getting the third-rate graduates of the third-rate schools and it's got to stop."

Letter from Regional Security and Intelligence officer at Chicago; the F.B.I. had turned over a derogatory information against Dr. Oslonski, mathematical physicist. "Hell. Write Oslonski a personal letter and tell him I'm sorry but he's going to be suspended from duty and barred from the grounds again. Tell him we'll get his clearance over within the minimum possible time and I know it's a lot of foolishness but policy is policy and we've got to think of the papers and Congress. Ask him please to consider the letter a very private communication. And process the S. and I. advisory."

A North Dakota senator wanted a job for his daughter, who had just graduated from Bennington. "Tell Morton to write him that Organization and Personnel hires, not the general manager."

Dr. Redford at Los Alamos wanted to resign; he said he felt he was getting nowhere. "Ask him please, as a personal favor to me, to delay action on his resignation until I've been able to have a talk with him. Put in something about our acute shortage of first-line men. And teletype the director there to rush-reply a report on the trouble."

A red-bordered, courier-transmitted letter from the Secretary of the Department of the Interior, stamped *Secret*. He wanted to know when he would be able to figure on results from A.E.C.'s A.D.M.P.—Atomic Demolition Material Programme—in connection with planning for Sierra Reclamation Project. "Tell Interior we haven't got a thing for him and haven't got a date. The feeling among the A.D.M.P. boys is that they've been off on a blind alley for the past year and ought to resurvey their approach to the problem. I'm giving them another month because Scientific Advisory claims the theory is sound. That's secret, by courier."

Hanford's quarterly omnibus report. "Acknowledge it and give it to Weiss to brief for me."

Messenger query from the Bennet newspapers; what about a rumour from Los Angeles that the A.E.C. had launched a great and costly programme for a space-rocket atomic fuel. "Tell them A.E.C. did not, does not, and probably will not contemplate a space-rocket fuel programme. Say I think I know where the rumour started and that it's absolutely without foundation, impossible to launch such a programme without diverting needed weaponeering personnel, etcetera."

Field Investigations wanted to know whether they should tell the Attorney General about a trucking line they caught swindling the A.E.C. "Tell them I don't want prosecution except as a last resort. I do want restitution of the grafted dough, I want the Blue Streak board of directors to fire the president and his damn cousin in the dispatcher's office, and most of all I want Field Investigations to keep these things from happening instead of catching them *after* they happen."

And so on.

MacIlheny went disconsolately to his room at the Willard and packed. They wouldn't start charging him for another day until 3.00 p.m.: he opened his portable and began tapping out his overdue "President's Message" for *Starward*, monthly bulletin of the American Society for Space Flight. It flowed more easily than usual. MacIlheny was sore.

Fellow Members:

I am writing this shortly after being given a verbal spanking by a high muckamuck of the A.E.C. I was told in effect to pick up my marbles and not to bother the older boys: the Government isn't interested in us bumbling amateurs. I can't say I enjoyed this after my hopes had been raised by the exchange of several letters and an invitation to see Mr. Holland about it "the next time I was in Washington." I suppose I mistook routine for genuine interest. But I've learned something out of this disheartening experience.

It's this: we've been wasting a lot of time in the A.S.F.S.F. by romancing about how the Government would some day automatically take cognizance of our sincere and persistent work. My experience today duplicates what happened in 1946, when our campaign for the Government to release unnecessarily classified rocketry art was the flop of the year.

You all know where we stand. Twenty years of theoretical work and math have taken us as far as we can go alone. We now need somebody else's money and somebody else's fuel. A lot of people have money, but under existing circumstances only the A.E.C. can have or ever be likely to have atomic fuel.

The way I feel about it, our next step is fund-raising—lots of it—hat-in-hand begging at the doors of industrial firms and scientific foundations. With that money we can go on from the drawing board to practical experimental work on bits and pieces of space ship, lab-testing our drawing-board gadgets until we know they work and can prove it to anybody—even an A.E.C. general manager.

When we have worked the bugs out of our jato firing circuits, our deadlight gaskets, our manhole seals, our acceleration couches, and the hundred-and-one accessories of space flight, we'll be in a new position. We will be able to go to the A.E.C. and tell them: "Here's a space ship. Give us fuel for it. If you don't, we'll hold you up to the scorn and anger of the country you are blindly refusing to defend."

*James MacIlheny
President, A.S.F.S.F.*

MacIlheny sat back, breathing hard and feeling more composed. There was no point to hating Holland, but it had been tragic to find him, a key man, afraid of anything new and even afraid to admit it, hiding behind Congress.

He still had some time to kill. He took from his brief case a report by the A.S.F.S.F. Orbit Computation Committee (two brilliant youngsters from Cal Tech, a Laguna Beach matron to punch the calculating machine and a flow-analysis engineer from Hughes Aircraft) entitled "Refined Calculations of Grazing Ellipse Braking Trajectories for a Mars Landing After a Flight Near Opposition." Dutifully he tried to read, but at the bottom of its first mimeographed page the report ran into the calculus of variations. MacIlheny knew no mathematics; he was no scientist and he did not pretend to be one. He was a rocket crank, he knew it, and it was twisting his life.

He threw himself into a chair and thought bitterly of the United States moon base that should have been established ten years ago, that should be growing now with the arrival of every monthly rocket. He knew it by heart; the observatory where telescopes—of moderate size, but unhampered by Earth's dense and shimmering atmosphere—would solve new stellar mysteries every day; the electronics lab where space-suited engineers would combine and recombine vacuum-tube elements with all outdoors for their vacuum tube; the hydroponics tanks growing green stuff for air and food, fed exhaled carbon dioxide and animal waste, producing oxygen and animal food under the raw sunlight on the Moon.

And he could see a most important area dotted with launchers for small, unmanned rockets with fission-bomb war heads, ready to smash any nation that hit the United States first.

He could see it; why not they? The scattered, unco-ordinated, conservative rocketry since World War II had produced what?

Army guided missiles, roaring across arcs of the Pacific every now and then on practice runs.

Air Force altitude jobs squirting up on liquid fuel from the deserts of the Southwest. There was a great, strange, powder-blue city of half a million souls at White Sands, New Mexico, where colonels spoke only to generals and generals spoke only to God. They were "working on" the space-flight problem; they were "getting out the bugs."

The Coast and Geodetic Survey firing its mapping rockets up and over, up and over, eternally, coast to coast, taking strips and strips of pictures.

The Bureau of Standards shooting up its cosmic-ray research rockets; for ten years they "had been developing" a space-suit for walking on the Moon. (There were space-suit drawings in the A.S.F.S.F. files—had been for fifteen years.)

The Navy had its rockets too. You could fire them from submarines, destroyers, cruisers, and special rocket-launching battlewagons that cost maybe sixty-odd what a space ship would stand you.

MacIlheny glumly told himself: might as well get to the airport. No point hanging around here.

He checked out, carrying his light overnight bag and portable. An inconspicuous man followed him to the airport; he had been following MacIlheny for weeks. They both enjoyed the walk; it was a coldly sun-bright January day.

II.

There was an immense documentation on Michael Novak, but it was no more extensive than the paper work on any other A.E.C. employee. For everyone—from scrubwoman to Nobel-prize physicist—the A.E.C. had one; so-and-so was eighty-seven years old and dribbled when he ate. Their backgrounds were checked to the times of their birth (it had once been suggested, in effect, that their backgrounds be checked to nine months before their birth—this by a congressman who thought illegitimacy should be sufficient reason for denying an applicant employment by the A.E.C.).

The Security and Intelligence Office files could tell you that Michael Novak had been born in New York City, but not that he had played tag under and around the pillars of the Canarsie Line elevated shortly before it was torn down. They could tell you that his mother and father had died when he was sixteen, but not that he had loved them. They could tell you that he had begun a brilliant record of scholarship-grabbing in high school, but not that he grabbed out of loneliness and fear.

Rensselaer Polytechnic Institute: aeronautical engineering (but he had been afraid to fly; heights were terrifying) and a junior-year switch to ceramic engineering, inexplicable to the A.E.C. years later.

A ten-month affair with a leggy, tough, young sophomore from the Troy Day College for Women. They interviewed her after ten years as a plump and proper Scarsdale matron; she told the Security men yes, their information was correct; and no, Michael had shown no signs of sexual abnormality.

Summer jobs at Corning Glass and Elpico Pottery, Steubenville, Ohio (but not endless tension: will they do what I tell them, or laugh in my face? Are they laughing at me now? Is that laughter I hear?). Ten years later they told the Security men sure I remember him, he was a good kid; no, he never talked radical or stuff like that; he worked like hell and he never said much (and maybe I better not tell this guy about the time the kid beat the ears off Wyrostek when he put the white lead in the kid's coverall pocket).

Scholarship graduate study at the University of Illinois, the Hopkins Prize Essay in Ceramic Engineering (with at first much envy of the scatterbrained kids who coasted four years to a B.A., later thin disgust, and last a half-hearted acceptance of things as they were).

The teaching fellowship. The doctoral dissertation on "Fabrication of Tubular Forms from Boron-Based High-Tensile Refractory Pastes by Extrusion." Publication of excerpts from this in the *Journal* of the Society of Ceramic Engineers brought him his bid from the A.E.C. They needed his speciality in N.E.P.A.—Nuclear Energy for the Propulsion of Aircraft.

He had taken it, his records showed, but they did not show the dream world he had thought N.E.P.A. would be, or the dismaying reality it was.

N.E.P.A. turned out to be one hour in the lab and three hours at the desk; bending the knee to seniors and being looked at oddly if you didn't demand that juniors bend the knee to you. It was wangling the high-temperature furnace for your tests and then finding that you'd been bumped out of your allotted time by a section chief or a group director riding a hobby. It was ordering twenty pounds of chemically pure boron and getting fifty-three pounds of commercial grade. It was, too often, getting ahead on an intricate problem and then learning by accident that it had been solved last year by somebody else in some other division. It was trying to search the records before starting your next job and being told that you weren't eligible to see classified material higher than *Confidential*. It was stamping your own results *Restricted* or at most *Confidential* and being told that it was safer, all things considered, to stamp them *Secret* and stay out of trouble.

It was being treated like a spy.

It was, in spite of all this, a chance to work a little at new and exciting problems.

And then, his records showed, in August of his second year, he had been transferred to Argonne National Laboratory, Chicago, as N.E.P.A. Refractories Group Liaison with Neutron Path Prediction Division of the Mathematical Physics Section. The records did not say why a ceramic engineer specializing in high-tensile refractories and with a smattering of aircraft background had been assigned to work in an immensely abstruse field of pure nuclear theory for which he had not the slightest preparation or aptitude.

From August to mid-December, the records said, he bombarded the office of Dr. Hurlbut, director of Argonne Lab, with queries, petitions, and requests for a rectification of his absurd assignment, but the records showed no answers. Finally, the records showed that he resigned from A.E.C. without prior notice—forefeiting all salaries and allowances due or to become due—on a certain day toward the end of the year.

This is what happened on that day.

Novak stopped in the cafeteria downstairs for a second cup of coffee before beginning another baffling day at Neutron Path Prediction—a day he hoped would be his last if Hurlbut had looked into the situation.

"Hi, there," he said to a youngster from Reactor Design. The boy mumbled something and walked past Novak's table to one in the corner.

Oh, fine. Now he was a leper just because he was the victim of some administrative foolishness. It occurred to him that perhaps he had become a bore about his troubles and people didn't want to hear any more about them. Well, he was sick of the mess himself.

A girl computer walked past with coffee and a piece of fudge cake. "Hi, there," he said, with less confidence. She had always been good for a big smile, but this time she really gave out.

"Oh, Dr. Novak," she gulped, "I think it's just *rotten*."

What was this—a gag? "Well, I hope to get it fixed up soon, Grace."

She sat down. "You're filing a grievance? You certainly ought to. A man in your position——"

"*Grievance*? Why, no! I actually saw Hurlbut yesterday, and I just grabbed him in the corridor and told him my troubles. I said that evidently my memos weren't getting through to him. He was very pleasant about it and he said he'd take immediate action."

She looked at him with pity in her eyes and said: "Excuse me." She picked up her tray and fled.

The kid was kidding—or nuts. Hurlbut would straighten things out. He was a notorious scientist-on-the-make, always flying all over the map for speaking dates at small, important gatherings of big people. You saw him often on the front pages and seldom in the laboratory, but he got his paper work cleaned up each month.

Novak finished his coffee and climbed the stairs to the Mathematical Physics Section. He automatically checked the bulletin board in passing and was brought up short by his own name.

FROM THE OFFICE OF THE DIRECTOR

To: Dr. Michael Novak (NPPD) Re: Requested Transfer

Your request is denied. The Director wishes to call your attention to your poor record of production even on the routine tasks it was thought best you be assigned to.

The Director suggests that a more co-operative attitude, harder work, and less griping will get you further than your recent attempts at office intrigue and buttonholing of busy senior officers.

"The man's crazy," somebody said at his shoulder. "You have a perfect grievance case to take to the——"

Novak ignored him. He ripped the memo from the board and walked unsteadily from the bare white corridors of the Mathematical Physics Section, through endless halls, and into the Administrative Division—carpets, beige walls, mahogany, business suits, pretty secretaries in pretty dresses walking briskly through these wonders.

He pushed open a mahogany door, and a receptionist stopped doing her nails to say: "Who shall I say is—hey! You can't go in there!"

In the carpeted office beyond, a secretary said: "What's this? What do you want?" He pushed on through the door that said: *Dr. Hurlbut's Secretary*.

Dr. Hurlbut's secretary wore a business suit that fitted like a bathing suit, and she said: "Oops! You weren't announced; you startled me. Wait a minute; Dr. Hurlbut is engaged——"

Novak walked right past her into the director's mahogany-furnished oak-paneled office while she fluttered behind him. Hurlbut, looking like the official pictures of himself, was sitting behind half an acre of desk. A man with him gaped like a fish as Novak burst in.

Novak slapped the memo on his desk and asked: "*Did you write this?*"

The director, impeccably clothed, barbered, and manicured, rose looking faintly amused. He read the notice and said: "You're Novak, aren't you? Yes, I wrote it. And I had it posted instead of slipping it into your box because I thought it would have a favourable effect on morale in general. Some of the section chiefs have been getting sadly lax. No doubt you were wondering."

He had been warned by the "personality card" that accompanied Novak on his transfer to expect such piffling outbursts. However, the man worked like the devil if you just slapped him down and kept hectoring him. One of those essentially guilt-ridden types, the director thought complacently. So pitifully few of us are smooth-running, well-oiled, efficient machines ...

"Here's my resignation," said Novak. He gave his resignation to Hurlbut on the point of the jaw. The Director turned up the whites of his eyes before he hit the grey broadloom carpeting of his office, and the man with him gaped more fishily than ever. The secretary shrieked, and Novak walked out, rubbing the split skin on his knuckles. It was the first moment of pure satisfaction he had enjoyed since they took him off refractories at N.E.P.A.

Nobody pulled the alarm. It wasn't the kind of thing Hurlbut would want on the front pages. Novak walked, whistling and unmolested across the lawn in front of Administration to the main gate. He unpinning his badge and gave it to a guard, saying cheerfully: "I won't be back."

"Somebody leave you a fortune?" the guard kidded.

"Uh, no," said Novak, and the mood of pure satisfaction suddenly evaporated. Nobody had left him a fortune, and he had just put a large, indelible blot on his career.

The first thing he did when he got back to his hotel was phone a situation-wanted ad to *Ceramic Industries*. Luckily he caught the magazine as it was closing its forms on classifieds; subscribers would have his ad in ten days.

They were ten bad days.

The local employment agencies had some openings for him, but only one was any good and he was turned down at the interview. It was a scientific supply house that needed a man to take over the crucibles and refractories department; it involved research. The president regretfully explained that they were looking for somebody a little more mature, a little more experienced in handling men, somebody who could take orders——

Novak was sure the crack meant that he knew about his informal resignation from A.E.C. and disapproved heartily.

All the other offers were lousy little jobs; mixing and testing batches in run-down Ohio potteries, with pay to match and research opportunities zero.

Novak went to cheap cinemas and ate in cheap cafeterias until the answers to his ad started coming in. A spark-plug company in Newark made the best offer in the first batch; the rest were terrible. One desperate owner of a near-bankrupt East Liverpool pottery offered to take him on as full partner in lieu of salary. "I feel certain that with a technical man as well qualified as yourself virtually in charge of production and with me handling design and sales we would weather our present crisis and that the ultimate rewards will be rich. Trusting you will give this proposal your serious——"

Novak held off wiring the Newark outfit to see what the next day would bring. It brought more low-grade offers and a curious letter from Los Angeles.

The letterhead was just an office number and an address. The writer, J. Friml, very formally offered Dr. Novak interesting full-time work in refractories research and development connected with very high-altitude jet aircraft. Adequate laboratory facilities would be made available, as well as trained assistance if required. The salary specified in his advertisement was satisfactory. If the proposition aroused Dr. Novak's interest, would he please wire collect and a telegraphed money order sufficient to cover round-trip expenses to Los Angeles would be forthcoming.

One of the big, coast aircraft outfits? It couldn't be anything else, but why secrecy? The letter was an intriguing trap, with the promised money order for bait. Maybe they wouldn't want him after all, but there was nothing wrong with a free trip to Los Angeles to see what they were up to. That is, if they really sent the money.

He wired J. Friml, collect, at the address on the letterhead:

Interested your offer but appreciate further details if possible.

The next morning a more-than-ample money order was slipped under his door, with the accompanying message:

Full details forthcoming at interview; please call on us at your convenience wiring in advance. Our office open daily except Sunday nine five. J. Friml, Secretary Treasurer.

Of what?

Novak laughed at the way he was being openly hooked by curiosity and a small cash bribe, and phoned for an airline reservation.

He left his bag at the Los Angeles airport and showered in a pay booth. He had wired that he would appear that morning. Novak gave the address to a cabby and asked: "What part of town's that?"

"Well," said the cabby, "I'll tell you. It's kind of an old-fashioned part of town. Nothing's *wrong* with it."

"Old-fashioned" turned out to be a euphemism for "run-down." They stopped at a very dirty eight-storey corner office building with one elevator. The lobby was paved with cracked octagonal tile. The lobby directory of tenants was enormous. It listed upwards of two hundred tenant firms in the building, quadrupled and quintupled up in its fifty-odd offices. Under *f* Novak found J. Friml, Room 714.

"Seven," he bleakly told the unshaved elevator man. Whatever was upstairs, it wasn't a big, coast plane factory.

Room 712 stopped him dead in the corridor with the audacity of the lettering on its glass door. It claimed to house the Arlington National Cemetery Association, the Lakeside Realty Corporation, the Western Equitable Insurance Agency, the California Veterans League, Farm and Home Publications, and the Kut-Rite Metal Novelties Company in one small office.

But at Room 714 his heart sank like a stone. The lettering said modestly: *American Society for Space Flight*.

I might have known, he thought glumly. Southern California! He braced himself to enter. They would be crackpots, the lab would be somebody's garage, they would try to meet their pay roll by selling building lots on Jupiter ... but they were paying for his time this morning. He went in.

"Dr. Novak?" said a young man. Nod. "I'm Friml. This is Mr. MacIlheny, president of our organization." MacIlheny was a rawboned middle-aged man with a determined look. Friml was sharp-faced, eye-glassed, very neat and cold.

"I'm afraid you might think you were brought here under false pretences, Doctor," said MacIlheny, as if daring him to admit it.

Friml said: "Sit down." And Novak did, and looked around. The place was clean and small with three good desks, a wall banked with good files—including big, shallow blue-print files—and no decorations.

"I asked for research and development work," Novak said cautiously. "You were within your rights replying to my ad if you've got some for me."

MacIlheny cracked his knuckles and said abruptly: "The anonymous offer was my idea. I was afraid you'd dismiss us as a joke. We don't get a very good press."

"Suppose you tell me what you're all about." It was their money he was here on.

"The A.S.F.S.F. is about twenty years old, if you count a predecessor society that was a little on the juvenile side. They 'experimented' with powder rockets and never got anywhere, of course. They just wanted to hear things go bang.

"An older element got in later—engineers from the aircraft plants, science students from Cal Tech and all the other schools—and reorganized the Society. We had a tremendous boom, of course, after the war—the V-2's and the atom bomb. Membership shot up to five thousand around the country. It dropped in a couple of years to fifteen hundred or so, and that's where we stand now."

Friml consulted a card: "One thousand, four hundred, and seventy-eight."

"Thanks. I've been president for ten years, even though I'm not a technical man, just an insurance agent. But they keep re-electing me so I guess everybody's happy.

"What we've been doing is research on paper. Haven't had the money for anything else until recently. Last January I went to Washington to see the A.E.C. about backing, but it was no dice. With the approval of the membership I went the rounds of the industrial firms looking for contributions. Some foresighted outfits came through very handsomely and we were able to go to work.

"There was a big debate about whether we should proceed on a 'bits-and-pieces' basis or whether we should shoot the works on a full-scale steel mock-up of a moon ship. The mock-up won, and we've made very satisfactory progress since. We've rented a few acres in the desert south of Barstow and put up shops and——" He couldn't keep the pride out of his voice. He opened his desk drawer and passed Novak an eight-by-ten glossy print. "Here."

He studied it carefully: a glamour photograph of a gleaming, massive, bomb-shaped thing standing on its tail in the desert with prefab huts in the background. It was six times taller than a man who stood beside it, leaning with a studied air against a delta-shaped fin. That was a lot of metal—a *lot* of metal, Novak thought with rising excitement. If the picture wasn't a fake, they had money and the thing made a little more sense.

"Very impressive," he said, returning the picture. "What would my job be?"

"Our engineer in charge, Mr. Clifton, is a remarkable man—you'll like him—but he doesn't know refractories. It seems to be all he doesn't know! And our plans include a ceramic exhaust throat liner and an internal steering vane. We have

the shapes, theoretically calculated, but the material has to be developed and the pieces fabricated."

"Internal steering vane. Like the graphite vanes in the various German bombardment rockets?"

"Yes, with some refinements," MacIlheny said. "It's got to be that way, though I don't envy you the job of developing a material that will take the heat and mechanical shock. Side-steering rockets would be much simpler, wouldn't they? But the practical complications you run into—each separate steering jet means a separate electrical system, a separate fuel pump, perforating structural members and losing strength, adding weight without a corresponding thrust gain."

"You said you weren't a technical man?" asked Novak.

MacIlheny said impatiently: "Far from it. But I've been in this thing heart and soul for a long time and I've picked up some stuff." He hesitated. "Dr. Novak, do you have a thick hide?"

"I suppose so."

"You'll need it if you go to work for us—crackpots."

Novak didn't say anything and MacIlheny handed him some press clippings:

LOCAL MEN SEE STARS;
BUILDING SPACE SHIP

and

BUCK ROGERS HEARTS BEAT
BENEATH BUSINESS SUITS

There were others.

"We never claimed," said MacIlheny a little bitterly, "that the *Prototype's* going to take off for the Moon next week or ever. We down-pedal sensationalism; there are perfectly valid military and scientific reasons for space-ship research. We've tried to make it perfectly clear that she's a full-scale model for study purposes, but the damned papers don't care. I know it's scared some good men away from the society and I'd hate to tell you how much it's cut into my business, but my lawyer tells me I'd be a fool to sue." He looked at his watch. "I owed you that much information, Doctor. Now tell me frankly whether you're available."

Novak hesitated.

"Look," said MacIlheny. "Why don't you take a look at the field and the *Prototype*? I have to run, but Friml will be glad to drive you out. You've got to meet Clifton."

When MacIlheny had left, Friml said: "Let's eat first." They went to a businessman's restaurant. Friml had hardly a word to say for himself through the meal, and he kept silence through the drive west to Barstow as the irrigated, roadside land turned arid and then to desert.

"You aren't an enthusiast?" Novak finally asked.

"I'm secretary-treasurer," said Friml.

"Um. Was Mr. MacIlheny deliberately not mentioning the names of the firms that contribute to the A.S.F.S.F.? I thought I caught that."

"You were correct. Contributions are private, by request of the donors. You saw those newspaper clippings."

His tone was vinegar. Friml was a man who didn't think the game was worth the kidding you took for playing it. Then why the devil was he the outfit's secretary-treasurer?

They were driving down a secondary black-top road when the *Prototype* came into view. It had the only vertical lines in the landscape for as far as the eye could see, and looked sky-piercing. A quadrangle of well-built prefabs surrounded it, and the area was wire-fenced. Signs at intervals forbade trespassing.

There was a youngster reading at a sort of sentry box in the fencing. He glanced at Friml and waved him through. Friml crawled his car to a parking area, where late models were outnumbered by jalopies, and brought it alongside of a monstrous, antique, maroon Rolls Royce. "Mr. Clifton's," he said, vinegar again. "He should be in here." He led Novak to the largest of the prefabs, a twelve-foot Quonset some thirty feet long and mounted on a concrete base.

It was a machine shop. Serious-eyed kids were squinting as they filed at bits of bronze. A girl was running a surface grinder that gushed a plume of small, dull red, hot-looking sparks. High-carbon steel, Novak thought automatically. Piece that size costs plenty.

Clifton, Friml's pointed finger said.

The man was in dungaree pants and a dirty undershirt—no, the top of an old-fashioned union suit with buttons. He was bending over a slow-turning engine lathe, boring out a cast-iron fitting. The boring bar chattered suddenly and he snarled at it: "A-a-ah, ya dirty dog ya!" and slapped off the power switch.

"Mr. Clifton," Friml hailed him, "this is Dr. Michael Novak, the ceramics man I told you about yesterday."

"Harya, Jay. Harya, Mike," he said, giving Novak an oily grip. He needed a shave and he needed some dentistry. He didn't look like any engineer in charge that Novak had ever seen before. He was a completely unimpressive Skid Row type, with a hoarse voice to match.

Clifton was staring at him appraisingly. "So ya wanna join the space hounds, hah? Where's ya Buck Rogers pistol?"

There was a pause.

"Conversation-stopper," said Friml with a meagre smile. "He's got a million of them, Mr. Clifton, would you show Dr. Novak around if it doesn't interrupt anything important?"

Clifton said: "Nah. Bar dug into the finish bore on the flange. I gotta scrap it now; I was crazy to try cast iron. That'll learn me to try to save you guys money; next time I cut the fitting outta nice, expensive, mild steel bar stock. Come on, Mike. Mars or bust, hah?"

He led Novak out of the machine shop and wiped his oily hands on the union suit's top. "You any good?" he asked. "I told the kids I don't want no lid on my hands."

"What's a lid?" Novak demanded.

"Morse-man talk. Fighting word."

"You were a telegrapher?" asked Novak. It seemed to be the only thing to say.

"I been everything! Farmer, seaman, gigolo in B.A., glass blower, tool maker, aero-engineer—bet ya don't believe a goddam word I'm saying."

Disgustedly Novak said: "You win." The whole thing was out of the question—crackpot enthusiasts backing this loudmouthed phony.

"Ask me anything, Mike! Go ahead, ask me anything!" Clifton grinned at him like a terrier.

Novak shrugged and said: "Integral of u to the n , $\log u$, $d-u$."

Clifton fired back: " U to the n -plus-one, bracket, $\log u$ over n -plus-one, minus one over n -plus-one-square, un-bracket—plus C . Ask me a hard one, Mike!"

It was the right answer. Novak happened to remember it as an examination problem that had stuck in his head. Normally you'd look it up in a table of integrals. "Where'd you go to school?" he asked, baffled.

"School? School? What the hell would I go to school for?" Clifton grinned. "I'm a self-made man, Mike. Look at that rocket, space hound. Look at her."

They had wandered to the *Prototype's* base. Close up, the rocket was a structure of beautifully welded steel plates, with

a sewerpipe opening at the rear and no visible means of propulsion.

"The kids love her," Clifton said softly. "I love her. She's my best girl, the round-heeled old bat."

"What would you use for fuel?" Novak demanded.

He laughed. "How the hell should I know, pal? All I know is we need escape velocity, so I build her to take the mechanical shock of escape velocity. *You* worry about the fuel. The kids tell me it's gotta be atomic so you gotta give 'em a throat-liner material that can really take it from here to Mars and back. Oh, you got a job on your hands when you join the space hounds, Mike!"

"This is the craziest thing I ever heard of," said Novak.

Clifton was suddenly serious. "Maybe it ain't so crazy. We work out everything except fuel and then we go to the A.E.C. and say *give*. Do they hold out on us or do they start work on an atomic fuel? The kids got it all figured out. We do our part, A.E.C. does theirs. Why not?"

Novak laughed shortly, remembering the spy mania he had lived in for two years. "They'll do their part," he said. "They'll start by sending a hundred Security and Intelligence boys to kick you off the premises so they can run it themselves."

Clifton slapped him on the back. "*That's* the spirit!" he yelled. "You'll win your Galactic Cross of Merit yet, pal! You're hired!"

"Don't rush me," said Novak, half angrily. "Are they honestly going to deliver on a real lab for me if I sign up? Maybe they don't realize I'll need heavy stuff—rock crushers, ball mills, arc furnaces—maybe a solar furnace would be good out here on the desert. That kind of equipment costs real money."

"They'll deliver," Clifton said solemnly. "Don't low-rate the kids. I'm working from their blue-prints and they're good. Sure, there's bugs—the kids are human. I just had to chuck out their whole system for jettisoning *Proto's* aerodynamic nose. Too gadgety. Now I'm testing a barometer to fire a powder charge that'll blow away the nose when she's out of the atmosphere—whole rig's external, no holes in the hull, no gasket problem. And they design on the conservative side—inclined to underestimate strength of materials. But, by and large, a ver-ry, ver-ry realistic bunch."

Novak was still finding it impossible to decide whether Clifton was a fake, an ignoramus, or a genius. "Where've you worked?" he asked.

"My last job was project engineer with Western Air. They fired me all right, no fear of that. I wear their letter next to my heart." He hauled a bulging greasy wallet from the left hip pocket of the dungarees, rummaged through it, and came up with a wad of paper. Unfolded, it said restrainedly that the personnel manager of Western Aircraft regretted that the Company had no option but to terminate Mr. Clifton's employment since Mr. Clifton had categorically declined to apologize to Dr. Holden.

An eighteen-year-old boy with a crew cut came up and demanded: "Cliff, on the nylon ropes the blue print says they have to test to one-fifty pounds apiece. Does that just mean parting strength of the ropes or the whole rig—ropes whipped to the D-rings and the D-rings anchored in the frame?"

"Be with ya in a minute, Sammy. Go and wait for me." The boy left and Clifton asked: "Think it's a forgery, Mike?"

"Of course not——" began Novak, and then he saw the engineer grinning. He handed back the letter and asked: "Have you been a forger too? Mr. Clifton——"

"Cliff!"

"——Cliff, how did you get hooked up with this? I'm damned if I know what to make of the setup."

"Neither do I. But I don't care. I got hooked up with them when Western canned me. I can't get another aircraft job because of the industrial black list, and I can't get a Government job because I'm a subversive agent or a spy or some goddamned thing like that." Suddenly he sounded bitter.

"How's that?"

"They don't tell you—you know that; your ad said you was with the A.E.C.—but I guess it's because I been around the world a couple of times. *Maybe*, they figure, just *maybe*, old Cliff sold out when we wasn't watching him. Also my wife's a foreigner, so better be safe than sorry, says Uncle Sam."

"I know that game," Novak said. "Doesn't matter. You wouldn't have lasted five minutes with A.E.C. even if they did hire you."

"Well, well! So I didn't miss a thing! Look, Mike. I gotta go show my kids how to wipe their noses, so I'll let ya rattle with your conscience and I hope to see you around." He gave Novak the oily grip again and walked cockily from the base of the rocket to the Quonsets.

Friml was at Novak's side instantly, looking impatient.

Driving back to Los Angeles, Novak asked bluntly: "Are you people building a moon ship or aren't you?"

"If the A.S.F.S.F. is building a moon ship," said Friml, "I don't want to hear about it. I should tell you that, whatever is being built, they've got a well-kept set of books and a *strictly* controlled audit on the purchasing." He gave Novak a little sidelong look. "One man they tried before Clifton made a very common mistake. He thought that because he knew technical matters and I didn't, he could pad his purchases by arrangement with the vendors' salesmen and I'd be none the wiser. It took exactly eight days for me to see through his plan."

"I get the hint," said Novak wearily. "But I still don't know whether I want the job. Was Clifton really a project engineer with Western Air?"

"I really don't know. I have absolutely no responsibility for procurement of personnel. I can tell you that he has no local or F.B.I. criminal record. I consider it a part of my job to check that far on employees whose duties include recommending expenditures."

Friml left him at the Los Angeles Airport at his request. Novak said he'd get in touch with him in the morning and let him know one way or the other; then he picked up his bag and took a taxi to a downtown hotel. It was 4.30 when he checked in, and he placed a call at once to the personnel department of Western Aircraft.

"I'd like to enquire," he said, "About the employment record of a Mr. Clifton. He says in his, uh, application to us that he was employed as a project engineer at Western Air last year."

"Yes, sir. Mr. Clifton's first name, sir?"

"Ah, I can't make it out from his signature." If he had been told Clifton's first name, he couldn't remember it.

"One moment, sir ... we have a Mr. August Clifton, project engineer, employed two years and five months, separated January seventeenth last year——"

"What's the reason for separation?"

"It says 'incompatibility with supervisory personnel.'"

"That's the one. Thanks very much, miss."

"But don't you want efficiency, health, and the rest of it, sir?"

"Thanks, no." He didn't need them. Anybody who hung on for two years and five months at Western as a projects man and only got fired after a fight *was* efficient and healthy and the rest of it; otherwise he wouldn't have lasted two hours and five minutes. It wasn't like the A.E.C.; at Western, you produced.

No, he thought, stretching out in his clothes on the bed; it wasn't like the A.E.C., and neither was the A.S.F.S.F. He felt a moment of panic at the thought, and knew why he felt it.

Spend enough time in Government and it unmans you. Each pay check drawn on the Treasury took that much more of yourself away from yourself. Each one of the stiff, blue-green paper oblongs punched with I.B.M. code slots made you

that much more willing to forget you might be running a pointless repeat of a research that had been done and done, and done, with nobody the wiser, in scattered and classified labs across the country.

Each swig from the public teat had more and more poppy juice in it. Gradually you forgot you had been another kind of person, holding ideas, fighting for them, working until dawn on coffee, falling for women, getting drunk sometimes. You turned grey after enough of the poppy juice—nice grey.

You said: "Well, now, I wouldn't put it that way," and "There's something to be said on both sides, of course," and "It doesn't pay to go overboard; the big thing is to keep your objectivity."

The nice grey people married early and had a child or two right away to demonstrate that they were normal family men. They had hobbies and talked about them to demonstrate that they weren't one-sided cranks. They drank a little, to demonstrate that they weren't puritans, but not much, to demonstrate that they weren't drunks.

Novak wondered if they tasted bile, as he was tasting it now, thinking of what he had almost become.

IV.

In the morning he phoned the A.S.F.S.F. office that he wanted the job. Friml's cold voice said: "That's fine, Dr. Novak. Mr. MacIlheny will be here for the next half-hour, and I have a contract ready. If you can make it right over——"

The contract hog-tied Novak for one year with options to conduct refractory research and development under the direction of the Society. The salary was the one he had specified in his ad. Novak raised his eyebrows at one clause: it released the employer from liability claims arising out of radiation damage to the employee.

"You really think the Government's going to let you play with hot stuff?" he asked.

He shouldn't have said "play". MacIlheny was hurt and annoyed. "We expect," he said testily, "that the A.E.C. will cooperate with us as a serious research group when we enter the propulsion stage of the programme. They'll be fools if they don't, and we intend to let the country know about it."

Novak shrugged and signed. So did the two Society officers, with the elevator man and the building porter as witnesses. MacIlheny shook Novak's hand ceremoniously after the witnesses were shooed out. "The first thing we want," he said, "is a list of what you'll need and a lab layout. Provisional, of course. There should be some changes after you study the problem in detail?"

"I think not," Novak told him. "A lab's a lab. It's what you do with it that counts. How high can I go?"

Friml looked alarmed. MacIlheny said: "I won't tell you that the sky's the limit. But get what you need, and if you see a chance to save us money without handicapping yourself, take it. Give us the maximum estimated cost and the people you think are the best suppliers for each item."

"*Reputable* firms," said Friml. "The kind of people who'd be prepared to send me a notarized invoice on each purchase."

Novak found the public library and gave himself a big morning in the technical reading room, playing with catalogues and trade-magazine ads. After lunch he came back with quadrille paper and a three-cornered scale. The afternoon went like lightning; he spent it drawing up equipment and supplies lists and making dream layouts for a refractories lab. What he wound up with was an oblong floor plan with a straight-through flow; storage to grinding-and-grading to compounding to firing to cooling to testing. Drunk with power, he threw in a small private office for himself.

Construction costs he knew nothing about, but by combing the used-machinery classifieds he kept equipment and supplies down to thirty-two thousand dollars. He had dinner and returned to the library to read about solar furnaces until they put him out at the ten-o'clock closing.

The next day Friml was up to his neck in page proofs of the A.S.F.S.F. organ *Starward*. Looking mad enough to spit, the secretary-treasurer said: "There's a publications committee, but believe it or not all five of them say they're too rushed right now and will I please do their work for them. Some of the rank and file resent my drawing a salary. I hope you'll bear that in mind when you hear them ripping me up the back—as you surely will."

He shoved the proofs aside and began to tick his way down Novak's lists. "There's a Marchand calculator in Mr. Clifton's laboratory," he said. "Wouldn't that do for both of you, or must you have one of your own?"

"I can use his."

Friml crossed the Marchand off the list. "I see you want a—a continuous distilled-water outfit. Wouldn't it be cheaper and just as good to install a tank, and truck distilled water in from the city? After all, it's for sale."

"I'm afraid not. I have to have it pure—not the stuff you buy for storage batteries and steam irons. The minute you put distilled water into a glass jar it begins to dissolve impurities out of the glass. Mine has to be made fresh and stored in a tin-lined tank."

"I didn't know that," said Friml. He put a light check mark next to the still, and Novak knew this human ferret would investigate it. Maybe he suspected him of planning to bilk the A.S.F.S.F. by making corn liquor on the side.

"Um. This vacuum pump. Mr. Clifton's had a Cenco Hyvac idle since he completed port-gasket tests a month ago. You might check with him as to its present availability ... otherwise I see no duplications. This will probably be approved by Mr. MacIlheny in a day or two and then we can let the contract for the construction of your lab. I suggest that you spend the day at the field with Mr. Clifton to clear a location for it and exchange views generally. You can take the bus to Barstow and any taxi from there. If you want to be reimbursed you should save the bus ticket stub and get a receipt from the taxi driver for my files. And tonight there's the membership meeting. Mr. MacIlheny asked me to tell you that he'd appreciate a brief talk from you—about five minutes and not too technical."

Friml dove back into the page proofs of *Starward*, and Novak left, feeling a little deflated.

The Greyhound got him to Barstow in ninety minutes. A leather-faced man in a Ford with "Taxi" painted on it said sure he knew where the field was: a two-dollar drive. On the road he asked Novak cautiously: "You one of the scientists?"

"No," said Novak. He humbly thought of himself as an engineer.

"Rocket field's been real good for the town," the driver admitted. "But scientists——" He shook his head. "Wouldn't mind some advice from an older man, would you?"

"Why, no."

"Just—watch out. You can't trust them."

"Scientists?"

"Scientists. I don't say they're all like that, but there's drinkers among them and you know how a drinker is when he gets to talking. Fighting Bob proved it. Not just talk."

This was in reference to the Hoyt speech that claimed on a basis of some very wobbly statistics that the A.E.C. was full of alcoholics. "That so?" asked Novak spinelessly.

"Proved it with figures. And you never know what a scientist's up to."

Enough of this nonsense. "Well, out at the field they're up to building a dummy of a moon ship to find out if it can be done."

"You ain't heard?" The driver's surprise was genuine.

"Heard about what? I'm new here."

"Well, that explains it. It's no dummy moon ship. It's camouflage for an oil-drilling rig. They struck oil there. The scientists are experimenting with it to make cheap gasoline. I heard it from the lineman that tends their power line."

"Well, he's wrong," Novak said. "I've been on the grounds and they aren't doing anything but working on the ship."

The driver shook his head. "Nossir," he said positively. "The thing's a dummy all right, but not for a space ship. Space ships don't work. Nothing for the rocket to push against. It stands to reason you can't fly where there's no air for it to push

against. You could fire a cannon to the Moon if you made one big enough, but no man could stand the shock. I *read* about it."

"In the Bennet newspapers?" asked Novak nastily, exasperated at last.

"Sure," said the driver, not realizing that he was being insulted. "Real American papers. Back up Fighting Bob to the hilt." The driver went on to lavish praise of the Bennet-Hoyt line on foreign policy (go it alone, talk ferociously enough and you won't have to fight); economics (everybody should and must have everything he wants without taking it from anybody else); and military affairs (armed forces second to none and an end to the crushing tax burden for support of the armed forces).

Novak stopped listening quite early in the game and merely interjected an occasional automatic "uh-huh" at the pauses. After a while the *Prototype* appeared ahead and he stopped even that.

The rocket, standing alone in the desert like a monument was still awe-inspiring. At the sentry box he introduced himself, and the boy on guard shook his hand warmly. "Glad to have you inboard, sir," he said. The word was unmistakably "inboard"—and when Novak had it figured out he had to bite his lip to keep from laughing. The kid was using rocket-ship slang before there were any rocket ships!

The boy never noticed his effort; he was too busy apologizing for stopping him. "You see, Doctor, people don't take our work seriously. Folks used to drive out here the first month and interrupt and even expect us to lend them our drinking water that we trucked out. As if we were here for their entertainment! Finally a gang of little devils broke into one of the Quonsets after dark and smashed everything they could reach. Four thousand dollars' worth of damage in twenty minutes! We were sick. What *makes* people like that? So we had to put up a real fence and mount guard, even if it doesn't look good. But of course we have nothing to hide."

"Of course——" began Novak. But the boy's face had suddenly changed. He was staring, open-mouthed. "What's the matter?" snapped Novak, beginning to inspect himself. "Have I got a scorpion on me?"

"No," said the boy, and looked away embarrassed. "I'm sorry," he said. "Only it suddenly hit me—maybe you'll be one of the people inboard when she—when she goes. But I shouldn't ask."

"The last I heard," Novak said, "*she* is a full-sized mock-up and isn't going anywhere."

The boy winked one eye slowly.

"All right," Novak shrugged, amused. "Have it your way and I'll see you on Mars. Where's Mr. Clifton?"

"Back of the machine shop—a new testing rig."

Crossing the quadrangle, Novak passed the *Prototype* and stopped for another look. To the Moon? This colossal pile of steel? It was as easy to visualize the Eiffel Tower picking up its four legs and waddling across Paris. No wonder the taxi driver didn't believe in space flight—and no wonder the kid at the gate did. *Credo quia impossibilis*, or however it went. There were people like that.

He heard Clifton before he saw him. The engineer in charge was yelling: "Harder! *Harder!* Is that all the hard ya can bounce? *Harder!*" And a girl was laughing.

Back of the machine shop, in its shadow, Clifton was standing with a stop watch over a vaguely coffin-shaped block of moulded rubber swung from a framework by rope. Most of the ropes were milky nylon. Six of them were manila and had big tension balances, like laundry scales, hooked into them. Towering over Clifton and the framework was a twelve-foot gas-pipe scaffold, and a pretty girl in shorts was climbing a ladder to the top of it.

As Novak watched, she hurled herself from the scaffold into the coffin. Clifton, blaspheming, snapped his stop watch and tried to read the jumping needles on the dials of all six balances at the same time.

"Hello," Novak said.

"Harya, Mike. Mike, this is Amy helping out. Like my rig?"

"I thought they worked all this out at the Wright-Patterson A.F.B. Space Medicine School. It is an acceleration couch, isn't it?"

"Kindly do not speak to me about Air Force Space Medicine," said Clifton distinctly. "It happens to be mostly bushwah. Ya know what happened? They had this ejector-seat problem, blowing a jet pilot out of a plane because he'd get cut in half if he tried to climb out at 600 m.p.h. So they had an acceleration problem and they licked it fine and dandy. So a publicity-crazy general says acceleration is acceleration, what's good enough for an ejector seat is good enough for a space ship and anyway nobody knows what the hell space flight is like so why worry?"

Clifton folded his arms, puffed out his chest, and assumed the Napoleonic stance, with one foot forward and the knee bent. His hoarse voice became an oily parody of the general's. "My gallant public relations officers! Let us enlighten the taxpaying public on what miracles us air force geniuses pass off daily before breakfast. Let us enlighten them via the metropolitan dailies and wire services with pictures. Let us tell them that we have solved all the medical problems of space flight and have established a school of space medicine to prove it. You may now kiss my hand and proceed to your typewriters at the gallop. To hell with the Navy!"

The girl laughed and said: "Cliff, it *can't* be that bad. And if you keep talking treason they'll lock you up and you'll pine away without your sweetheart there." She meant *Proto*.

"A-a-ah, what do you know about it, ya dumb Vassar broad? What time's Iron Jaw pick you up? Time for any more bounces?"

"Barnard, not Vassar," she said, "and no time for more bounces, because he said he'd be here at noon and Grady is the world's best chauffeur." She took a wrap-around skirt from a lower horizontal of the gas-pipe scaffolding and tied it on. "Are you a new member, Mike?" she asked.

"I'm going to work on the reaction chamber and throat liner."

"Metal or ceramic?"

"Ceramic refractories is my field."

"Yes, but what about strength? I was thinking about tungsten metal as a throat-liner material. It's a little fantastic because it oxidizes in air at red heat, but I have an idea. You install a tungsten liner and then install a concentric ceramic liner to shield it. The ceramic liner takes the heat of the exhaust until the ship is out of atmosphere and then you jettison it, exposing the tungsten. In vacuum, tungsten holds up to better than three thousand centigrade——"

Clifton bulled into it. "Ya crazy as a bunny rabbit, Amy! What about atmosphere on Mars or Venus? What about the return trip to Earth? What about working the tungsten? That stuff crystallizes if ya look at it nasty. What about paying for it? Ya might as well use platinum for cost. And what about limited supply? Ya think America's going to do without tool bits and new light bulbs for a year so ya can have five tons of tungsten to play with? Didn't they teach economics at Miss Twitchell's or wherever it was?..."

It was exactly noon by Novak's watch and a black Lincoln rolled through the gate and parked.

"See you at the meeting, Cliff? Glad to have met you, Mike." The girl smiled, and hurried to the car. Novak saw a white-haired man in the back open the door for her, and the car drove off.

"Who was *that*?" Novak asked.

"She's Miss Amelia Earhart Stuart to the society pages," Clifton grinned. "In case ya don't read the society pages, she's the daughter of Wilson Stuart—my old boss at Western. She got bit by the space bug and it drives him crazy. The old man's a roughneck like me, but he's in a wheel chair now. Wrecked his heart years ago test-flying. He's been looking backwards ever since; he thinks we're dangerous crackpots. I hear ya got the job okay. Where do you want the lab?"

They left the test rig and walked around the machine-shop Quonset. Clifton stopped for a moment to measure the *Prototype* with his eye. It was habitual.

"How much of a crew does she—would she—hold?" Novak asked.

"Room for three," Clifton said, still looking at her.

"Navigator, engineer—and what?"

"Stowaway, of course!" Clifton roared. "Where ya been all ya life? A girl stowaway in a tin braseer with maybe a cellophane space suit on. Buckle down, Mike! On the ball or I don't put ya in for the Galactic Cross of Merit!"

Novak wouldn't let himself be kidded. "The youngster at the gate might stow away," he said. "He thinks the *Prototype* is going to take off some day and we just aren't telling the public about it."

Clifton shook his head—regretfully. "Not without the A.E.C. develops a rocket fuel and gives it to us. The bottom two thirds of her is a hollow shell except for structural members. I wish the kid was right. It'd be quite a trip and they'd have quite a time keeping me off the passenger list. But I built the old bat, and I know."

Novak picked an area for his lab and Clifton okayed it. They had lunch from a refrigerator in the machine shop, with a dozen kids hanging on their words.

"Give ya an idea of what we're up against, Mike," Clifton said around a pressed-ham sandwich. "The manhole for *Proto*. It's got to open and close, it's got to take direct sunlight in space, it's got to take space-cold when it's in shadow. What gasket material do you use? What sealing pressure do you use? Nobody can begin to guess. Some conditions you can't duplicate in a lab. So what some smart cookie in the A.S.F.S.F. figured out ten years ago was a wring fit, like jo-blocks. Ya know what I mean?"

Novak did—super-smooth surfaces, the kind on hundred-dollar gauges. Put two of those surfaces together and they clung as if they were magnetized. The theory was that the molecules of the surfaces interpenetrate and the two pieces become—almost—the same piece. "Ingenious," he said.

"Ingenious," muttered Clifton. "I guess that's the word. Because nobody ever in the history of machine shops put a jo-block finish on pieces that size. I got a friend in South Bend, so I sent him the rough-machined manhole cover and seating. The Studebaker people happen to have a big super-finish boring mill left over from the war, sitting in a corner covered with cosmoline. Maybe my friend can con them into taking off the grease and machining a super-finish onto our parts. If not, I'll try to hand scrape them. If I can't do it on circular pieces—and I probably can't—I'll scrap them and order square forgings. You think *you* got troubles with your throat liner?"

"Generally, what kind of shape is *Proto* in?"

"Generally, damn fine shape. I finish testing the acceleration couch today. If it passes I order two more pads from Akron and install them. Then we're all ready to go except for the manhole problem and a little matter of a fuel and propulsion system that oughtta be cleared up in eight-ten years. A detail."

Clifton picked his teeth and led Novak to a blue-print file. He yanked open one of the big, flat drawers and pulled out a 36-by-48 blue print. "Here we are," he said. "The chamber, liner, and vane. You're gonna have to make it; you might as well look it over. I'm gonna appoint a volunteer and supervise some more crash dives."

Novak took the print to an empty corner of the shop and spread it out on a work-bench. He looked first at the ruled box in the lower right-hand corner for specifications. He noted that the drawing had been made some three months ago by "J. MacI." and checked by him. Material: ceramic refractory; melting point higher than 3,000°C.; coefficient of expansion, less than .000,004; bulk modulus ...

Novak laughed incredulously.

It was *all* there—stretch, twist, and bulk moduli, coefficient of elasticity, everything except how to make it. MacIlheny had laid down complete specifications for the not-yet-developed liner material. A childish performance! He suspected that the president of the A.S.F.S.F. was simply showing off his technical smattering and was mighty proud of himself. Novak wondered how to tell MacIlheny tactfully that under the circumstances it would be smarter to lay down specifications in the most general terms.

He studied them again and laughed again. Sure he could probably turn out something like that—one of the boron carbides. But it would be a hell of a note if A.E.C. came up with a 3,750-degree fuel and they had a 3,500-degree liner,

or if the A.E.C. came up with a hydroxide fuel that would dissolve a liner which was only acidproof. What MacIlheny should have said was something simpler and humbler, like: "Give us the best compromise you can between strength and thermal-shock resistance. And, please, as much immunity to all forms of chemical attack as you can manage."

Well, he'd tell him nicely—somehow.

Novak looked from the specifications to the drawings themselves and thought at first that there had been some mistake—the right drawings on the wrong sheet, the wrong drawings on the right sheet—but after a puzzled moment he recognized them vaguely as a reaction chamber and throat liner.

They were all wrong; all, all wrong.

He knew quite well from N.E.P.A. what reaction chambers and throat liners for jet aircraft looked like. He knew standard design doctrine for flow, turbulence, Venturi effect, and the rest of it. There were tricks that had been declassified when newer, better tricks came along. This—this *thing*—blithely by-passed the published tricks and went in for odd notions of its own. The ratio of combustion volume to throat volume was unheard of. The taper was unheard of. The cross section was an ellipse of carefully defined eccentricity instead of the circle it should be. There was only one hole for fuel injection—only one hole! Ridiculous.

While the shop was filled with the noise of a youngster inexpertly hack-sawing sheet metal in a corner, Novak slowly realized that it was not ridiculous at all. It wasn't MacIlheny showing off; no, not at all. Anybody who could read a popular-science magazine knew enough not to design a chamber and throat like that.

But MacIlheny knew better.

He walked slowly out to the back of the shop where Clifton was clocking dives into the acceleration couch. "Cliff," he said, "can I see you for a minute?"

"Sure, Mike. As long as ya don't expect any help from me."

Together they looked down at the spread blue print, and Novak said: "The kid at the gate was right. They are going to take off some day and they just aren't telling the public about it."

"What ya talking?" demanded Clifton. "All I see there is lines on paper. Don't try to kid a kidder, Mike."

Novak said: "The specs are for me to develop a material to handle a certain particular fuel with known heat, thrust, and chemical properties. The drawings are the wrong shape. Very wrong. I know conventional jet theory and I have never seen anything like the shapes they want for the chamber and throat of that—thing—out there."

"Maybe it's a mistake," Clifton said uncertainly.

Then he cursed himself. "Mistake! Mistake! Why don't I act my age? Mistakes like this them boys don't make. The acceleration couch. They designed it eight years ago on paper. It works better than them things the Air Force been designing and building and field-testing for fifteen years now."

Novak said: "People who can do that aren't going to get the throat and chamber so wrong they don't look like any throat and chamber ever used before. *They've got a fuel and they know its performance.*"

Clifton was looking at the data. "MacIlheny designed it—it says here. An insurance man three months ago sat down to design a chamber and throat, did it, checked it, and turned it over to you to develop the material and fabricate the pieces. I wonder where he got it, Mike. Russia? Argentina? China?"

"Twenty countries have atomic energy programmes," Novak said. "And one year ago the A.S.F.S.F. suddenly got a lot of money—a hell of a lot of money. I ordered thirty-two thousand dollars' worth of gear and Friml didn't turn a hair."

Clifton muttered: "A couple of million bucks so far, I figure it. Grey-market steel. Rush construction—overtime never bothered them as long as the work got done. Stringing the power line, drilling the well. A couple million bucks and nobody tells ya where it came from." He turned to Novak and gripped his arm earnestly. "Nah, Mike," he said softly. "It's *crazy*. Why should a country do research on foreign soil through stooges. It just ain't possible."

"Oh, God!" said Novak. His stomach turned over.

"What's the matter, kid?"

"I just thought of a swell reason," he said slowly. "What if a small country like the Netherlands, or a densely populated country like India, stumbled on a rocket fuel? And what if the fuel was terribly dangerous? Maybe it could go off by accident and take a couple of hundred miles of terrain with it. Maybe it's radiologically bad and poisons everybody for a hundred miles around if it escapes. Wouldn't they want the proving ground to be outside their own country in that case?"

There was a long pause.

Clifton said: "Yeah. I think they might. If it blows up on their own ground they lose all their space-ship talent and don't get a space ship. If it blows up on our ground they also don't get a space ship, but they do deprive Uncle Sam of a lot of space-ship talent. But how—if the fuel don't blow up California—do they take over the space ship?"

"I don't know, Cliff. Maybe MacIlheny flies it to Leningrad and the Red Army takes it from there. Maybe Friml flies it to Buenos Aires and the Guardia Peronista."

"Maybe," said Cliff. "Say, Mike, I understand in these cloak-and-dagger things they kill you if you find out too much."

"Yeah, I've heard of that, Cliff. Maybe we'll get the Galactic Cross of Merit posthumously. Cliff, *why* would anybody want to get to the Moon bad enough to do it in a crazy way like this?"

The engineer took a gnawed hunk of tobacco from his hip pocket and bit off a cud. "I can tell ya what MacIlheny told me. Our president, I used to think, was just a space hound and used the military-necessity argument to cover it up. Now, I don't know. Maybe the military argument was foremost in his mind all the time.

"MacIlheny says the first country to the Moon has got it *made*. First rocket ship establishes a feeble little pressure dome with one man left in it. If he's lucky he lives until the second trip, which brings him a buddy, more food and oxygen, and a stronger outer shell for his pressure dome. After about ten trips you got a corporal's squad on the Moon nicely dug in and you can start bringing them radar gear and launchers for bombardment rockets homing on earth points.

"Nobody can reach you there, get it? *Nobody*. The first trip has always gotta bring enough stuff to keep one man alive—if he's lucky—until the next trip. It takes a lotta stuff when ya figure air and water. The first country to get there has the bulge because when country two lands their moon pioneer the corporal's squad men hike on over in their space suits and stick a pin in his pressure dome and—he dies. Second country can complain to the U.N., and what can they prove? The U.N. don't have observers on the Moon. And if the second country jumps the first country with an A-bomb attack, they're gonna *die*. Because they can't jump the retaliation base on the Moon."

He squirted tobacco juice between his teeth. "That's simplified for the kiddies," he said, "but that's about the way MacIlheny tells it."

"Sounds reasonable," Novak said. "Personally I am going right now to the nearest regional A.E.C. Security and Intelligence Office. You want to come along?" He hoped he had put the question casually. It had occurred to him that, for all his apparent surprise, Clifton was a logical candidate for Spy Number One.

"Sure," said Clifton. "I'll drive you. There's bound to be one in L.A."

V.

There was, in the Federal Building.

Anheier, the agent in charge, was a tall, calm man. "Just one minute, gentlemen," he said, and spoke into his intercom. "The file on the American Society for Space Flight, Los Angeles," he said, and smiled at their surprise. "We're not a Gestapo," he said, "but we have a job to do. It's the investigation of possible threats to national security as they may involve atomic energy. Naturally, the space-flight group would be of interest to us. If the people of this country only knew the patience and thoroughness—here we are."

The file was bulky. Anheier studied it in silence for minutes. "It seems to be a very clean organization," he said at last.

"During the past fifteen years derogatory informations have been filed from time to time, first with the F.B.I. and later with us. The investigations that followed did not produce evidence of any law violations. Since that's the case, I can tell you that the most recent investigation followed a complaint from a certain rank-and-file member that Mr. Joel Friml, your secretary-treasure, was a foreign agent. We found Mr. Friml's background spotless and broke down the complainant. It was a simple case of jealousy. There seems to be a certain amount of, say, spite work and politics in an organization as—as visionary as yours."

"Are you suggesting that we're cranks?" Novak demanded stiffly. "I'm a Doctor of Philosophy of the University of Illinois and I've held a responsible position with the A.E.C. And Mr. Clifton has been a project engineer with Western Aircraft."

"By no means, by no means!" Anheier said hastily. "I know your backgrounds, gentlemen." There was something on his face that was the next thing to a smile. Novak was suddenly, sickeningly sure that Anheier, with patience and thoroughness, had learned how he had socked his A.E.C. director in the jaw and how Clifton had been fired after a fight with his boss. A couple of congenital hotheads, Anheier would calmly decide; unemployables who can't get along with people; crank denouncers and accusers.

Anheier was saying, poker-faced: "Of course we want complete depositions from you on your—your information."

He buzzed and a stenographer came in with a small, black, court machine. "And if investigation seems in order, of course we'll get going with no lost time. First give your name and personal data to the stenographer and then your facts, if you please." He leaned back calmly, and the stenographer zipped out the paper box of his machine and poised his fingers. He looked bored.

"My name is Michael Novak," Novak said, fighting to keep his voice calm and clear. The stenographer's fingers bumped the keys and the paper tape moved up an inch. "I live at the Revere Hotel in Los Angeles. I am a ceramic engineer with the B.Sc. from Rensselaer Polytechnic Institute and M.Sc. and Ph.D. from the University of Illinois. I was employed after getting my doctorate by the U.S. Atomic Energy Commission in various grades, the last and highest being A.E.C. 18. I—I left the A.E.C. last month and took employment with an organization called the American Society for Space Flight at its Los Angeles headquarters.

"I had no previous knowledge of this organization. I was told by officers that it is now making a full-scale metal mock-up of a moon ship to study structural and engineering problems. Purportedly it has no space-ship fuel in mind and intends to ask the co-operation of the A.E.C. in solving this problem after it has solved all the other problems connected with the design of a space ship.

"I believe, however, that this is a cover story. I believe that about one year ago the organization was supplied with funds to build an actual space ship by a foreign power which has developed a space-ship fuel.

"My reasons for believing this are that the organization has liberal funds behind it which are supposed to be private contributions from industry, but there are no signs of outside interests in the project; further, I was ordered to execute an extremely unorthodox design for a reaction chamber and throat liner, which strongly suggests that the organization has an atomic space-ship fuel and knows its characteristics.

"I want to emphasise that the unorthodox design which aroused my suspicions was purportedly drawn and checked by James MacIlheny, president of the organization, an insurance man who disclaims any special technical training. In other, nonvital details of the space ship, designing was done mostly by technical men employed in the aircraft industry and by local college students and teachers following space flight as a hobby of a technical nature. It is my belief that the reaction chamber and throat liner were designed by a foreign power to fit their atomic fuel and were furnished to MacIlheny.

"I do not know why a foreign power should erect a space ship off its own territory. One possibility that occurs to me is that their fuel might be extremely dangerous from a radiological or explosive standpoint or both, and that the foreign power may be unwilling to risk a catastrophic explosion on its own ground or radiation sickness to large numbers of its own valued personnel."

He stopped and thought—but that was all there was to say.

Anheier said calmly: "Thank you, Dr. Novak. And now Mr. Clifton, please."

The engineer cleared his throat and said aggressively: "I'm August Clifton. I been a self-educated aero engineer for nine years. For Douglas I designed the B-108 air frame and I rode production line at their Omaha plant. Then I worked for Western Air, specializing in control systems for multijet aircraft. Last year I left Western and went to work for the A.S.F.S.F.

"My ideas about the A.S.F.S.F.'s backing and what they're up to are the same as Novak's. I been around the Society longer, so I can say more definitely than him that there is not one sign of any business or industry having any stake in what's going on out at the field. That's all."

"Thanks, Mr. Clifton. They'll be typed in a moment." The stenographer left. "I understand there's one prominent industrialist who shows some interest in the Society? Mr. Stuart?" There was a ponderously roguish note in Anheier's voice.

"Ya crazy, Anheier," Clifton said disgustedly. "He's just looking after his daughter. *You* think we're nuts? You should hear Iron Jaw take off on us?"

"I know," smiled Anheier hastily. "I was only joking."

"What about MacIlheny?" asked Novak. "Have you investigated him?"

Anheier leafed through the A.S.F.S.F. file. "Thoroughly," he said. "Mr. MacIlheny is a typical spy——"

"*What?*"

"——I mean to say, he's the kind of fellow who's in a good position to spy, but he isn't and doesn't. He has no foreign contacts and none of the known foreign agents in this country have gone anywhere near him——"

"What ya talking?" demanded Clifton. "You mean there's spies running around and you don't pick them up?"

"I said foreign agents—news-service men, exchange students, businessmen, duly registered propaganda people, diplomatic and consular personnel—there's no end to them. *They* don't break any laws, but they recruit people who do. God knows *how* they recruit them. Every American knows that since the Rosenberg cases the penalty for espionage by a citizen is, in effect, death. That's the way the country wanted it, and that's the way it is."

"Why do you say MacIlheny's typical?" asked Novak. He had a half-formed hope that this human iceberg might give them some practical words on technique, even if he refused to get excited about their news.

"Mata Hari's out," said Anheier comfortably. "You've seen spies in the papers, Dr. Novak." To be sure, he had—ordinary faces, bewildered, ashamed, cowering from the flash bulbs. "I came up via the accountancy route myself so I didn't see a great deal of the espionage side," Anheier confessed a bit wistfully. "But I can tell you that your modern spy in America is a part-timer earning a legitimate living at some legitimate line. Import-export used to be a favourite, but it was too obvious."

"Hell, I should think so," grinned Clifton.

Anheier went on: "Now they recruit whatever they can, and get technical people whenever possible. This is because your typical state secret nowadays is not a map or code or military agreement but an industrial process.

"The Manhattan District under General Groves and the British wartime atomic establishment were veritable sieves. The Russians learned free of charge that calutron separation of U-235 from U-238 was impractical and had to be abandoned. They learned, apparently, that gaseous diffusion is *the* way to get the fissionable isotope. They learned that implosion with shaped charges is a practical way to assemble a critical mass of fissionable material. They were saved millions of dead-ended man-hours by this information.

"Security's taken a nice little upswing since then, but we still have secrets and there are still spies, even though the penalty is death. Some do it for money, some are fanatics—some, I suppose, just don't realize the seriousness of it. Here are your depositions, gentlemen."

They read them and signed them.

Anheier shook their hands and said: "I want to thank you both for doing your patriotic duty as you saw it. I assure you that your information will be carefully studied and appropriate action will be taken. If you learn of anything else affecting national security in the atomic area in your opinion, I hope you won't hesitate to let us know about it." Clearly it was a speech he had made hundreds of times—or thousands. The brush-off.

"Mr. Anheier," Novak said, "what if we take this to the F.B.I.? They might regard it more seriously than you seem to."

The big, calm man put his palms out protestingly. "Please, Dr. Novak," he said. "I assure you that your information will be thoroughly processed. As to the F.B.I., you're perfectly free to go to them if you wish, but it would be wasted motion. Cases in the atomic area that come to the F.B.I. are automatically bucked to us—a basic policy decision, and a wise one in my opinion. Technical factors and classified information are so often involved——"

In the street Novak said disgustedly: "He didn't ask us any questions. He didn't ask us whether we were going to quit or not."

"Well—are we?"

"I guess I am—I don't know, Cliff. Maybe I'm wrong about the whole business. Maybe I'm as crazy as Anheier thinks I am."

"Let's go to my place," Clifton said. "We oughtta go to the A.S.F.S.F. membership meeting tonight after we eat."

"Cripes, I'm supposed to make a speech!"

"Just tell 'em hello."

They got into Clifton's car, the long, tall, 1930 Rolls with the lovingly maintained power plant, and roared through Los Angeles. Clifton drove like a maniac, glaring down from his height on underslung late models below and passing them with muttered fusillades of curses. "Me, I like a car with *character*," he growled, barreling the Rolls around a '56 Buick.

His home was in a pretty, wooded canyon dotted with houses. Gravel flew as he spun into the driveway.

"Come and meet Lilly," he said.

Outside, the Clifton house was an ordinary five-room bungalow. Inside it was the dope-dream of a hobbyist run amuck. Like geologic strata, tools and supplies overlaid the furniture. Novak recognized plasticene, clay, glazes, modeling tools and hooks, easels, sketch boxes, cameras, projectors, enlargers, gold-leaf burnishers, leather tools, jeweller's tools and the gear of carpenters, machinists, plumbers, electricians and radio hams. Lilly was placidly reading an astrology magazine in the middle of the debris. She was about thirty-five: a plump, grey-eyed blonde in halter and shorts. The sight of her seemed to pick Clifton up like a shot of brandy.

"Mama!" he yelled, kissing her loudly. "I'm sick of you. I brought you this here young man to run away with. Kindly leave without making no unnecessary disturbance. His name is Mike."

"Hallo," she said calmly. "Don't pay him no attention; he always yokes. Excuse how I talk; I am a Danish. How many letters you got in your full complete name?"

"Uh—twelve."

"Good," she dimpled. "I am twelve also. We will be friends, it means."

"I'm very glad," Novak said faintly.

"Mike, you've been factored?"

"I don't think I understand——"

"It's biomat'ematics. You know? You go to a biomat'ematicist and he finds the mat'ematical for-moola of you subconscious and he factors out the traumas. It's va-a-ary simple." Her face fell a little. "Only I got a Danish-speaking

subconscious of course, so vit' me it goes a liddle slow. Funny"—she shook her head—"same t'ing happened to me years ago vit' di'netics. Cliff, you gonna give Mike a drink or is he like the other young feller you had here last month? Feller that broke the big mirror and you nineteen-inch cat'ode-ray tube and my Svedish pitcher——"

"How the hell was I supposed to know?" he roared. In an aside: "That was Friml, Mike. He got pretty bad."

"Friml?" asked Novak incredulously. "The ice-water kid?"

"He should go to a biomat'ematicist," sighed Lilly. "If ever a boy needed factoring, it's him. Make me only a liddle one please; I don't eat yet today."

She had a little Martini and Clifton and Novak had big ones.

"We all go to the meeting tonight I guess? First I want *biftek aux pommes de terre* someplace."

"What the hell, Mama!" Clifton objected. "This time yesterday you was a vegetarian for life."

"I change my mind," she said. "Go get shaved up and dress you'self and we go someplace for *biftek*."

When Clifton appeared—shaved, dressed, and subdued—Lilly was still in the bedroom, putting on finishing touches. The two men had another martini apiece.

"What about the contracts?" Novak asked.

Clifton understood. "If they try to hold us to them we could just lie down on the job and let them pay us. Hate to work it like that, though. It'd be dull."

"It's still the craziest business I ever heard of."

Lilly appeared, looking sexy in a black dinner dress with a coronet of blonde hair swept up from her creamy neck. Clifton let out a long, loud wolf-howl and said: "The hell with the beefsteaks and the meeting. Let's——"

"Later," said Lilly firmly.

As the maroon Rolls thundered down the canyon, Clifton said casually: "I may quit the space hounds, Mama."

"So what you gonna do for a job?"

"Buy you a red dress and turn mack, I guess. Nah, ya too old and ugly. Maybe I'll open a radio shop or ship out again for an electrician; I guess I still got my card. I kinda hate to leave my best girl out there in the desert, but the whole thing's a joke. She's pretty, but she'll never amount to a damn."

Novak knew why he was lying about the reason. *I understand in these cloak-and-dagger things they kill you if you find out too much.*

VI.

They had dinner at a downtown restaurant and were at the A.S.F.S.F. meeting hall by 8.30. Novak was alarmed when the building turned out to be the Los Angeles Slovak Sokol Hall, rented for the occasion.

"Foreigners!" he exclaimed. "Does the A.S.F.S.F. go around *looking* for jams to get into?"

"Relax, Mike," Clifton told him. "The Sokol's strictly American by now. They got a long anti-Communist record."

Still, fretted Novak, foreigners—Slavic foreigners. The building was in the same run-down area that housed the Society's business office. It was liberally hung with American flags and patriotic sentiments. Inconspicuous on the lobby walls were a few photographs of group calisthenics and marchers in Czech national costumes, from decades ago.

A well-worn placard on an easel said that the A.S.F.S.F. meeting was being held at 8.30 in the main hall, straight ahead and up the stairs.

About a score of people in the lobby were having final smokes and talking. Novak could divide them easily into two

types: juvenile space hounds and employed hobbyists. The hobbyists were what you'd see at any engineers' convention: pipe-smokers, smiling men, neat, tanned. The space hounds were any collection of juvenile enthusiasts anywhere—more mature than an equal number of hot-rod addicts, perhaps, but still given to nervous laughter, horse-play, and catchwords.

Their entrance had been the signal for the younger element to surround Clifton and bombard him with questions.

"Cliff, how she coming?"

"Mr. Clifton, need a good carpenter at the field?"

"How's the acceleration couch coming, Cliff?"

"Could we get that boring mill at South Bend?"

"Shaddap!" said Clifton. "Leave a man breathe, will ya!" They loved him for it. "What's the movie tonight?"

"A stinker," one girl told him. "*Pirates of the Void*, with Marsha Denny and Lawrence Malone. Strictly for yocks."

"They show a space-flight movie," Clifton explained to Novak. "There ain't enough business to kill the time and send everybody home in the proper state of exhaustion." He towed his wife and Novak up the stairs, where a youngster at a card table challenged their membership. They were clamorously identified by a dozen youngsters and went in. The hall seated about four hundred and had a stage with a movie screen and more American flags.

"Better sit in the back——" began Clifton, and then: "For God's sake!" It was Anheier, smiling nervously.

"Hello," said the Security man. "I thought I'd combine business with pleasure. Marsha Denny's a great favourite of mine and I understand there's going to be a preview tonight."

"Well, enjoy yourself," Clifton said coldly. He took Lilly and Novak to the left rear corner of the auditorium and they sat down. He told his wife: "An A.E.C. guy we met. A creep."

MacIlheny climbed to the stage and called to stragglers in the back of the hall: "Okay, men. Let's go." They found seats.

Crack went the gavel. "The-meeting-is-called-to-order. The-chair-will-entertain-a-motion-to-adopt-the-standard-agenda-as-laid-down-in-the-organization's-byelaws."

"So move," said somebody, and there was a ragged chorus of seconds.

"All-in-favor-signify-by-raising-one-hand-any-opposed? The-motion-seems-to-be-and-is-carried. First-on-the-agenda-is-the-reading-of-previous-meetings-minutes."

Somebody stuck his hand up, was recognized, and moved that the minutes be accepted as read. The motion was seconded and carried without excitement. So were motions to accept and adopt reports of the membership, orbit computation, publications, finance, structural problems and control mechanisms committees.

"Making good time," Clifton commented.

Under "good and welfare" a belligerent-looking youngster got recognized and demanded the impeachment of the secretary-treasurer. There was a very mild, mixed demonstration: some applause and some yells of "Sit down!" and "Shuddup!" MacIlheny rapped for order.

"The motion is in order," he wearily announced. "Is there a second?" There was—another belligerent kid.

"In seconding this motion," he said loudly, "I just want to go over some ground that's probably familiar to us all. With due respect to the majority's decision, I still feel that there's no place for salaried employees in the A.S.F.S.F. But if there *has* to be a paid secretary-treasurer, I'm damned if I see why an outsider with no special interest in space flight _____"

Friml was on his feet in the front row, clamouring for recognition on a point of personal privilege.

"Damn it, Friml, I wasn't insulting you——"

"That's for the chair to decide, Mr. Grady! I suggest you pipe down and let him."

"Who're you telling to——"

MacIlheny hammered for silence. "Chair recognizes Mr. Friml."

"I simply want a ruling on the propriety of Mr. Grady's language. Thank you."

"The chair rules that Mr. Grady's remarks were improper and cautions him to moderate his language."

Breathing hard, the youngster tried again. "In seconding this motion to impeach, I want to point out that there are members with *much* more seniority in the organization than Mr. Friml and with a long-demonstrated record of interest in space flight which he cannot match."

MacIlheny called for debate and recognized one of the engineer-types.

"It should be evident to all of us," the engineer said soothingly, "that the criterion for the secretary-treasurer's office ought to be *competence*. We're not playing with marbles any more—I'm happy to say. And I for one am very much relieved that we have the services of a man with a B.B.A., an M.B.A., and a C.P.A. after his name."

"Now, I may have more organizational experience than Mr. Grady, since I've been somewhat active in the A.S.M.E. and the aeronautical societies. I name no names—but in one of those groups we were unwise enough to elect a treasurer who, with all the good will in the world, simply didn't know how to handle the job. We were rooked blind before we knew what hit us, and it took a year to straighten the records out. I don't want that to happen to the A.S.F.S.F., and I seriously urge that the members here vote against the impeachment. Let's not monkey with a smooth-running machine. Which is what we've got now."

There was a lot of applause.

A thin, dark girl, rather plain, was recognized. Her voice was shrill with neurotic hatred. "I don't know what's become of the A.S.F.S.F. In one year I've seen a decent, democratic organization turned into a little despotism with half a dozen people—if that!—running the works while the plain members are left in the dark. Who is this Friml? How do we know he's so good if we don't know the amount and nature of the contributions he handles? And *Mr.* August Clifton, whom everybody is so proud of, I happen to know he was fired from Western Aircraft! The fact is, MacIlheny's got some cash donors in his hip pocket and we're all afraid to whisper because he might——"

MacIlheny pounded for silence. "The chair rules Miss Gingrich out of order," he said. "This is debate on a motion to impeach Mr. Friml and not to reconsider a policy of accepting contributions in confidence, which was approved by the membership as the minutes show. Miss Stuart, you're recognized."

Amy Stuart got up looking grim. "I want to make two statements. First, on a point of personal privilege, that Mr. Clifton was fired from Western because he was too high-spirited to get along in a rather conservative outfit and not for incompetence. More than once I've heard my father say that Mr. Clifton was—or almost was—the best man he had working for him."

"Second, I move to close debate."

"Second the motion," somebody called from the floor.

Miss Gingrich was on her feet shrilling: "Gag rule! Nobody can open his mouth around here except the Holy Three and their stooges! We were doing all right before MacIlheny——" The rest was lost in shouts of disapproval and the whacking of the gavel. The girl stood silently for a moment and then sat down, trembling.

"Motion to close debate has been made and seconded. This motion takes precedence and is unamendable. All in favour raise one hand." A forest of hands went up. "Any opposed?" Maybe twenty. "The motion is carried. We now have before us a motion to impeach Mr. Friml, our secretary-treasurer. All in favour." The same twenty hands. "Opposed?" The forest of hands rose again, and a few kids cried: "No, no!"

"The motion is defeated. Unless there are further matters under good and welfare"—he was refusing to let his eye be caught, and half a dozen members were trying to catch it—"we will proceed to the introduction of a new A.S.F.S.F. full-

time scientific worker. Dr. Michael Novak comes to us from two years with the United States Atomic Energy Commission. He has been working with high-tensile, refractory ceramic materials—a vital field in rocketry; I'm sure the application to our work is obvious to all. Dr. Novak."

He was on his feet and starting down the aisle to a polite burst of applause. They might be spies or they might not; he might be working for them tomorrow or he might not, but meanwhile there was a certain rigmarole you went through at these things, and he knew it well.

"Mr. President, members, and guests, thank you." Now the joke. "My field of work stems from very early times. It was a cave man who founded ceramic engineering when he accidentally let a mud-daubed wicker-basket fall into his campfire and pulled out, after the fire died down, the first earthenware pot. I presume he did not realize that he was also a very important pioneer of space flight." A satisfactory chuckle.

Now the erudition. "Basically, my problem is to develop a material which is strong, workable, and heat-resistant. For some years the way to tackle such a job has been to hunt the material among the so-called 'solid solutions'. An alloy is a familiar example of a solid solution—the kind in which both the solvent and the solute are metals.

"The substance tungsten carbide is well known to any of you who have machine-shop experience. It is a solid solution with one non-metallic constituent, and its properties have revolutionized industrial production. Dies and tool bits of this fantastically hard stuff have probably increased the productivity of this country by several per cent with no other changes being put into effect. Idle time of machine tools has been reduced because tungsten-carbide bits go on, and on, and on without resharpening. Idle time on presses of all sorts has been reduced because tungsten-carbide dies go on, and on, and on without replacement.

"This is only one example of the way Mother Nature comes up with the answer to your particular problem if you ask her in the right way. She also offers among the solid solutions the chromium and cobalt carbides, which top tungsten carbide for refractory qualities, and the boron carbides with which I intend to work.

"In the solid solutions there is a situation that rules out dramatic, abrupt crystallizations of one's problem. An organic chemist trying to synthesize a particular molecule may leap up with a shriek of 'eureka—I've got it!' And so he may, for an organic molecule either is there or it isn't: a yes-or-no situation. But in working with solutions rather than compounds, there is continuous variation of solvent to solute. Theoretically, it would take an infinite amount of time to explore the properties of *every* boron carbide, even if their properties varied simply and continuously with the ratio of constituents alone. But it is more complicated than that.

"Actually the properties you seek in your carbides do not appear when you turn out a batch fresh from your crucible. There is the complicated business of ageing, in which the carbide spends a certain time at a certain temperature. Two more variables. And in some cases the ageing should be conducted in a special atmosphere—perhaps helium or argon. Another variable! And secondary properties must be considered. For example, the standard ceramic bond to metal is obtained by heating both parts to red heat and plunging them into liquid air. There are carbides that may have every other desirable property but which cannot take such a drastic thermal shock."

MacIlheny, in the front row, was looking at his watch. Time for the windup. "I hope I've given you an idea of what we're up against. But I hope I haven't given you an idea that the problem's uncrackable in a less-than-infinite amount of time, because it isn't. Experiments in some number must be made, but mathematics comes to the aid of the researcher to tell him when he's on the right track and when he's going astray. With the aid of the theory of least squares, plenty of sweat, and a little dumb luck I hope before long to be able to report to you that I've developed a material which can take the heat and thrust of any escape-velocity fuel which may some day come along."

The applause was generous.

"We have the privilege tonight," MacIlheny was saying, "of being the first audience in this area to see the new space-flight film *Pirates of the Void*—" There were a few ironical cheers. "—through the kindness of Mr. Riefenstahl of United Productions' promotion staff. Audience comment cards will be available on the way out. I think it would be only fair and courteous if all of us made it a point to get one and fill it out, giving our—*serious*—opinion of the movie. And I'd like to add that Sokol Hall has made *two* projection machines available to us, so that this time there will be no interruption for changing between reels." The cheers at that were not ironical.

"I'm gonna the men's room," Clifton announced, and left.

"Cliff don' like movies much," Lilly announced proudly. "He'll be back."

The lights went out and *Pirates of the Void* went on with a fanfare and the United Productions monogram.

The film, thought Novak as he watched, was another case of the public's faith that space flight is an impossibility. It was a fable in which the actors wore odd garments: the men, shiny overalls; and the women, shiny shorts and bras. The time was far in the future—far enough for there to be pirates of space and a Space Navy of the United World to battle them. Space flight tomorrow, but never space flight today. *But MacIlheny had a fuel and knew its performance.*

He leaned back, wishing he could smoke, and saw Marsha Denny's problem unfold. Marsha was a nurse in the Space Navy and she had a brother (but there was a plant indicating that he wasn't really her brother, though she didn't yet know that), in the Pirate Fleet, high up. She was in love with Lawrence Malone, who took the part of the muscular G-2 of the Space Navy and had assigned himself the mission of penetrating the Pirate Fleet in the guise of a deserter from the regulars.

Somehow fifteen minutes of it passed, and Lilly leaned across the seat between them. "Mike," she asked worriedly, "you mind doing somet'ing for me? You go and find Cliff? He's gone an awful long time."

"Why, sure," he whispered. "Glad to get out of here."

He slipped from the dark auditorium and promptly lit a cigarette. *Men's Room*, said a sign with an arrow. He followed it to a big, empty washroom with six booths. One of the doors was closed.

"Cliff?" he called, embarrassed. There was no answer.

Cliff must be in the corridor somewhere. His eye was caught by the shine of gold on the corner of a washstand. A wedding band—Cliff's wedding band? Slipped it off before he washed his hands? There was no engraving in it and he didn't remember what Cliff's ring looked like; just that he wore one.

Maybe——

"Mister," he said to the closed door, "I found a gold ring on the washstand. You lose it?"

There was no answer. A thread of crimson blood snaked from under the closed door, slowly over the tiled floor, seeking a bright brass drain.

I understand in these cloak-and-dagger things they kill you if you find out too much.

To be continued

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[The end of *Takeoff, Part 1* by Cyril M. Kornbluth.]