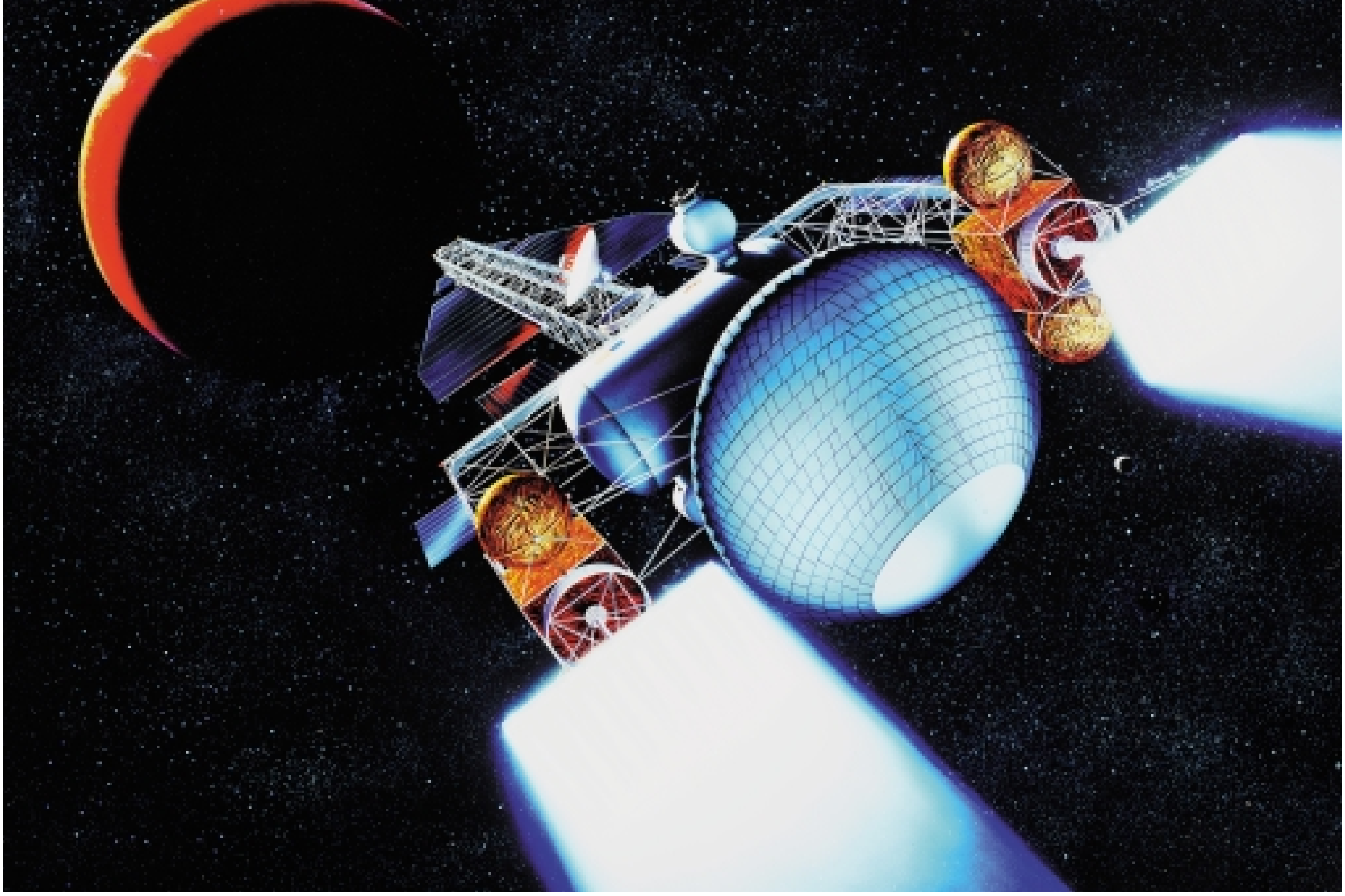


An artist's concept, done in 1992, showing a nuclear electric–propelled vehicle, about the size of a football field, firing banks of ion thrusters to circularize its orbit around Mars. Assembled in Earth orbit, the transfer vehicle with its 10-MW power plant could transport 130-tonne payloads to Mars in 6½ months, and could repeat its circuit every 52 months. (Image created for NASA by Patrick Rawlings of SAIC)

A *NUCLEAR NEWS* INTERVIEW

Rocket man: Nuclear is the way to Mars

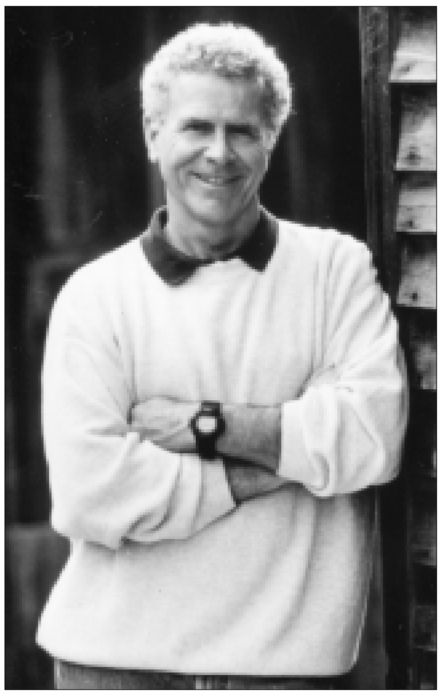
"The payoff for nuclear thermal rockets is just huge . . . . The energy that you can get from nuclear fission . . . is enormous."

As a boy in the late 1950s, Homer Hickam knew he wanted to devote his life to the American space program on the night he spotted *Sputnik* blinking overhead. Nearly half a century later, Hickam is a retired NASA engineer who lives in Huntsville, Ala., home of the Marshall Space Flight Center. He is the author of *Rocket Boys,* the 1998 memoir about his boyhood adventures building rockets and growing up in the coal-mining town of Coalwood, W.Va., which was turned into the film *October Sky,* released in 1999. He also has penned the thriller *Back to the Moon* (1999) and *The Coalwood Way* (2000), which continued on his memoir, among other books.

In the *Wall Street Journal* earlier this year, Hickam wrote an op-ed piece, under the headline "The Path to Greatness," in which he recommended that the nation undertake a program "to develop and field advanced nonchemical rocket engines," which are "necessary if we're to ever seriously go into the solar system."

Since nuclear propulsion systems are included in the array of "advanced nonchemical rocket engines," *NN* was interested to learn more about Hickam's thoughts on nuclear technologies and about his career. He proved to be both a knowledgeable and enthusiastic supporter of nuclear space technologies, and gladly recounted his reasons, as well as details on his remarkable life and career.

The interview was conducted by Patrick Sinco, *NN* associate editor.



Hickam: A prolific author

You can trace the origin of your life's work to the evening in 1957 when you saw Sputnik *darting across the sky. What was it about the satellite that made such an impact on you?*

First you have to understand about Coalwood itself—Coalwood being a pure company town, where I grew up. Basically that's all we knew—the town itself and the coal company. And it seemed like everything that I'd read, whether it was in books or newspapers or magazines or whatever, was about places that had nothing to do with Coalwood. Everything that was important was outside Coalwood.

The thing about *Sputnik* was that it came to Coalwood, which made a huge impact on my thinking. One night I had read in the newspaper that it was going to be flying over Coalwood and I told my mom that I was going to go watch it. Many townspeople, including the boys who later turned out to be the Rocket Boys, showed up in my backyard. My dad, by the way, wouldn't watch it. He said that President Eisenhower would never allow anything Russian to fly over West Virginia.

Nevertheless, *Sputnik* came along. The impact on me was that, all of a sudden, here was something that was of tremendous importance to the outside world—had gotten the whole country stirred up—and there it was right overhead. In Coalwood. And when I saw *Sputnik* fly over I knew at that moment that somehow, some way, I wanted to be part of the American response to *Sputnik.* I wanted to be part of the space program.

How did you go about accomplishing that?

Well, first thing, of course, was I became an amateur rocketeer. I felt like in order to get a job with a space agency and go to work for Dr. Wernher von Braun, I would have to go interview the same as a miner would have to go interview with my father [a superintendent at the coal mine] to get a job at the mine. And I'd seen those interviews. My dad would sit them down at his desk and he'd ask them, "Well, what can you do for the mine?" And then the miner would say, "Well, I can run this equipment, or I can do explosives, or I can weld," or whatever. So, I figured one of these days I was going to have to sit down in front of Wernher von Braun and tell him what I could do. And the only thing that I could figure out was that I had better learn how to build rockets. So, that led to the entire adventure of being a Rocket Boy, which led into the story that became *October Sky.*

As far as going to school, I determined that I was going to be an engineer. And I determined that the closest and best engineering school to Coalwood was actually across the state line in Virginia, at a school called Virginia Polytechnic Institute, VPI. So, I decided I would go to VPI, which is now known as Virginia Tech, and get my engineering degree there, which I did.

Did you work for NASA straight out of college?

No, it took me many years actually to work for NASA. I was 38 years old when I finally started working for NASA. First thing was Vietnam. When I came out of VPI I had a six-year tour of active duty with the army. And part of that was in Vietnam.

I had kind of a zigzag path to get to NASA, but I was always determined that I would get there, and I kept applying. However, NASA was not hiring very many engineers during that entire post-Apollo period. And it was just on a fluke that Marshall Space Flight Center here in Huntsville needed somebody with my background in computers and they hired me.

I had my own agenda, though. As soon as I came here I worked on the computers for about three months and then went off and found other jobs that I liked better—like spacecraft design. So, I immediately got off into spacecraft design.

When you were in the army, were you able to draw upon any of your experience in rocketry?

That was set aside for a little while. I saw rockets while I was in the army, but they were all made by the Soviet Union and they were all coming down on top of me [laughs]. Those were the only rockets I saw.

What were some of the major projects you were involved with at NASA over the years?

Well, the three big programs that I worked on for NASA were Spacelab, Hubble Space Telescope, and Space Station.

With Spacelab, I got involved early on with the design of that spacecraft. Spacelab was a laboratory module that fit into the cargo bay of the Space Shuttle. Every time it flew, a different set of experiments was put inside in racks. These experiments were designed for a variety of different experiments. It was a very versatile laboratory. It was only carried in space for the duration of a shuttle flight, of course, which was anywhere between one week and two-and-a-half weeks, at most. So, therefore, the experiments were limited in duration. But, an advantage was you could swap out your experiments completely, so you were able to do a lot more science in Spacelab. We did a lot more science in Spacelab than the Russians ever did in the Mir, by probably a thousandfold, because of the versatility of Spacelab and the variety of experiments, plus the care that was taken with the experiments.

I came to work for NASA in 1981, and got started on spacecraft design at that point. Spacelab really got going about five years later, about 1986.

At that point, I was also heavily involved with the requirements for modular maintenance and repair of the Hubble Space Telescope. I was into that design, working underwater in the Neutral Buoyancy Simulator, here in Huntsville. I'm a scuba instructor, so that naturally led me to get involved with that.

Between the knowledge that I was gaining in both the Spacelab and Hubble Space Telescope, that ultimately led me to getting into the training of astronauts for both the Hubble and Spacelab. The reason for that was they were looking for somebody who had a background in all of that and also had an interest in training. And I did, as a scuba instructor.

I didn't, however, work but very peripherally in propulsion with NASA. And the reason for that was NASA simply was not building new rocket engines during most of that period. The shuttle engines were basically based upon the technology that came out of the *Saturn V.* There was no requirement, really, for any new rocket engines at that time. So, I didn't have the opportunity. I would have jumped at it if it had come up.

Since then, there has been some movement at NASA to put NASA engineers back to work in propulsion, I'm happy to say. And a lot of that, of course, is in some of this advanced stuff, including nuclear.

You never got to work for Wernher von Braun then, did you?

No, I never got to meet Dr. von Braun at all. In the movie, they had me shake his hand. But that was just to make me feel good. The director said, "Well, Homer, I'm going to finally let you meet Dr. von Braun." The actor who played him was actually the special effects man, and he was a spitting image of a young Dr. Wernher von Braun.

Dr. von Braun, of course, died in the mid-1970s, before I came to work for NASA. And I really wish that I could have met or at least have seen him. But, many of his team now are among my friends. There never has been a more, I think, disciplined and intelligent group of rocketeers anywhere in the world. And we were very fortunate to get them over here after World War II.

What were some of the rocketeering skills that von Braun and his team brought from Germany?

In the first place, they were just excellent engineers and scientists. But they brought with them a certain hard-headed experience, too. They knew what they needed to do to make things work. And one of the things was test to failure. They didn't build rocket engines on computers. They built them by hand, and then they tested them until they blew up or wore out or fell apart. And then they knew what their limitations were, they knew how far they could push them, they knew exactly what their parameters were.

Nowadays, they can't afford to do that anymore, or so they say. A lot of times we end up with prototypes that we're not exactly sure what the limitations are, how far we can push them. The von Braun team would have never allowed that.

Plus, when they turned over any of their designs to a contractor to build, they went with it. And they stood over the contractor and made sure they bolted that thing together precisely the way they had designed it to be.

Nowadays, mostly NASA managers contract out their work. They depend on the expertise of the contractor to build whatever it is that they're going to build. Sometimes that works and sometimes it doesn't. The von Braun team experience was that it never works. The best thing to do is to design it in-house, hand it over to a contractor to build, but watch them like a hawk.

Continued

In the 1960s, when NASA was a new agency with lots of energetic young talent and a huge Apollo-*scale budget, it achieved greatness. Now that NASA is an older and unavoidably more bureaucratic agency, do you think it has lost some of its direction?*

No. I think NASA does what it can with what the politicians let them do. I think NASA is quite capable now of accomplishing an *Apollo*-like space program. The engineers and scientists that work for NASA, and their contractors, are every bit as sharp as they used to be.

The difference is, of course, they only do what they're allowed to do. Right now, it looks like Space Station is about all that they're going to be allowed to do—and some deep-space probes, and some work with instrumentation on Mars, and these kinds of projects. NASA engineers have to take what's handed over to them by the politicians.

So, you really can't blame NASA for the lack of vision. It wasn't NASA that came up with the moon program. It wasn't NASA that came up with the first satellite. It was basically the government—the president, and the leaders of the country—saying, "We need to go to the moon. Or, we need to launch satellites. We need to explore Mars."

NASA can only push so far. You talk to your basic NASA engineer, and he or she will tell you that they mostly signed on to build on the *Apollo* program, and they want to go back to the moon, and they want to send people to Mars, and they want to mine asteroids—they want to do all these things. There's plenty of vision there. But, because they are federal employees, they really are not allowed to go out and proselytize for themselves. They have to do what they're allowed to do. And Space Station right now, unfortunately, is the only thing on their plate.

And that appears to be taking money away from other projects, such as a manned mission to Mars.

Yeah, it really does. I think that right now, we should be building our infrastructure in a big way to go into space, rather than spending all of our space budget on Space Shuttle and Space Station.

The infrastructure I'm talking about is that essentially, NASA needs some way to get large payloads into orbit and beyond and be able to traverse large sections of space rapidly. That's one of the things that we have learned about the human body, especially in space, is that you need to get it through space in a hurry. Both the zero G and radiation that you find in space are not good for the human body. So, you need to get through it in a hurry.

But right now we have no way of doing that, except chemical rocket systems. And, again, everything that we have is essentially *Saturn V*–era stuff. So, the truth of the matter is, about all we can do is exactly what we're doing—unless we build up our infrastructure with what I call "big bad rockets," or new propulsion systems that will allow us to carry heavy payloads into space and on out to the moon and beyond. Otherwise, if we don't build that infrastructure, then we're always going to be stuck in low-earth orbit like we are right now. I don't see us ever going back to the moon or to Mars or anywhere else using chemical rockets. So, we need to make that decision. And, I think a large chunk of NASA's budget should be carved out and applied to the serious business of building the infrastructure. And by that I mean the advanced rocket systems.

In a few op-ed pieces in the Wall Street Journal, you have mentioned that nuclear power and propulsion is essential for outer planet space probes and a manned mission to Mars. What are the advantages of nuclear rockets?

Nuclear rocket systems, of course, of all the advanced proposals, are the easiest to build. I mean, we were actually building them back in the '60s with the NERVA [Nuclear Engine for Rocket Vehicle Application] program. They were actually tested and did quite well. I think we should start from that as our basis and start building on it.

I'm not the least bit afraid of the protesters of nuclear energy. I think they're just way off base. It seems to me that if there ever is a great application for nuclear energy, it's to be used in space. We use it in nuclear submarines now without any problem whatsoever. They're in the world's oceans every day and life goes on. And it will go on the same if we use nuclear energy in space.

The payoff for nuclear thermal rockets is just huge. In comparison, chemical rocket systems are extremely heavy and produce just tiny amounts of thrust.

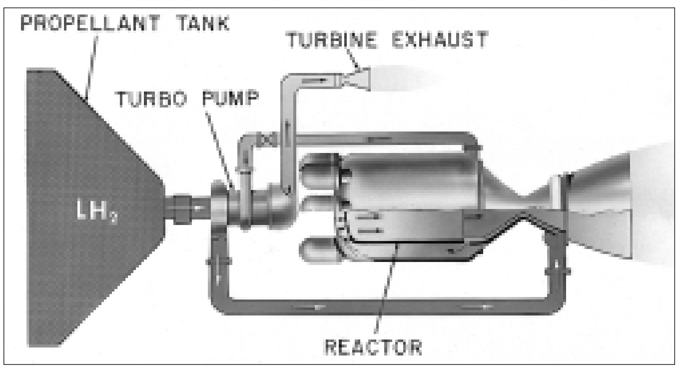
The energy that you get from nuclear fission, compared to the weight of the system, is enormous. With chemical rocket systems, you basically have to carry huge amounts of liquid propellant that are rapidly exhausted. And then you essentially go into a drift mode.

Say you want to go the moon. The first thing you do is go into low-earth orbit at 5 miles per second, then you switch on another chemical rocket which boosts you up to 7 miles per second. That's what it takes—that's the escape velocity—to go out to the moon. Once you hit that 7 miles per second, your engine turns off. Because you don't have enough propellant to keep accelerating. So, basically, at 25 000 miles per hour, you switch off and you start drifting toward the moon. It's like you're in a kayak and you paddle real hard and then you stop and let the current carry you. Well, it carries you for awhile. The earth keeps trying to drag you back, and you just make it barely into where the moon's gravitational field takes over. That's why it takes so many days to go to the moon, because you're essentially just drifting.

Now, with a nuclear system, you could accelerate a lot farther before you turn your engine off. You have to turn it off somewhere along the line or you'll accelerate right past the moon. But, with a nuclear thermal rocket, you could go to the moon in a matter of hours. You could simply accelerate, turn around and decelerate, and there you are. What a huge difference that makes and how much more sense that makes to go with a nuclear rocket rather than the old chemical systems. And in my mind it would be almost criminal to try to recreate the *Apollo* program when we have the capability to build nuclear rockets.

And, again, when it comes to people protesting about nukes in

A model of the NERVA engine



The NERVA (Nuclear Engine for Rocket Vehicle Application) engine's hot bleed cycle, in which a small amount of hydrogen gas is diverted from the thrust nozzle, thus eliminating the need for a separate system to drive the turbine. The NERVA engine, based on KIWI nuclear reactor technology, was intended to power a RIFT (Reactor-In-Flight-Test) nuclear stage. (NASA) space and all that, I just think that they're ridiculous. And the politicians need to treat them that way. They're like Chicken Little: "The sky is falling, the sky is falling!" These are the same bunch that would much prefer that we burn coal for energy rather than put in a nuclear plant, which makes no sense whatsoever. What could be more polluting than a coal plant? [Laughs.] But that's where they're coming from. In my mind they just are not worth slowing down a program as important as the space program, based upon some of their invalid theories.

What do we need to do to get to Mars?

In the first place, we need to build the system. And that's what happened with the *Apollo* program. Essentially, all of the theoretical work had been done when John Kennedy stood up and said, "We're going to go to the moon. We're going to do it in this decade." And so, all we had to do was to extrapolate on that, on what the von Braun team had done with the *Redstone* rocket. (Basically, the *Saturn V* ultimately ended up being just a super-duper *Redstone* rocket. It used essentially the same technology.) So, John Kennedy could make the promise to the nation and to the world that we were going to go do that because the technology was already developed.

We don't have that now with the nuclear rocket or any of the other advanced rocket systems. And that's what we need to do first.

Then we need to actually cut metal on some of these systems and fly them. Of course, the best way to do that is not with human spaceflight but with robotic spaceflight. I've seen some proposals for nuclear electric rocket engines that would be used to go out to Pluto. And I think that would be a good place to test such a system out.

The first thing we should do is to build these engines with the plan to just use them for robotic-type missions. Then once they're tested and approved, then they can be applied to human spaceflight.

What would be a good way to demonstrate the capabilities of these systems?

Of course, I personally believe that the next time that we will go back to the moon—and Americans will go back to the moon—we'll be using one of these advanced propulsion systems, whether it's nuclear thermal, electric, or something beyond that—nuclear fusion or antimatter, I don't know. But, my bet is on the nuclear thermal system for manned spaceflight. We'll go back to the moon simply as a test flight of one of those systems. We'll bump out there—and not land—and go around and come back to prove that it's safe to fly on.

Now, mankind may go back to the moon before that, but it won't be Americans. It could be the Chinese, maybe. They won't do an entire *Apollo* program—they don't have that capability. But they might do a fly around. With a chemical system they could certainly do that within a decade.

So, we test the nuclear or another advanced propulsion system by going around the moon. And I think the next thing that would be wise would be to build a laboratory on the moon to learn about living in space, to learn how the moon might be used as a resource for energy and for other resources, and then take a look at Mars real seriously.

In the meantime, of course, we need to be exploring Mars robotically and finding as much about it as we possibly can, and have some missions where we recover and bring back rocks and other materials from Mars. So that when our astronauts go, they go with an idea of what to look for and where to look for it. But I don't see us ever going to Mars using chemical systems.

Why bother going back to the moon? What resources does it have?

Well, one of them I can say immediately is helium-3. Helium-3 is a by-product of the solar wind, which covers the moon. Any airless body—anything in the solar system without an atmosphere—collects the solar wind or the by-products of the solar wind, including helium-3. Helium-3 is a very interesting substance. It looks like it may be a very good fuel for fusion reactors. So, I think it's one that we need to study. If it could be used for fusion reactors, then we probably have about a thousand years' worth on the moon alone to keep our civilizations going here on earth.

But, we don't know what else may be on the moon that may be of value. That's just one of the things that we learned by bringing back about a thousand pounds of moon rocks. That's just one thing. There's probably a lot more there. I think, also, just learning how to live in space and going back and forth to a moon laboratory, I think, we'll just learn so much that will later come in handy when we decide to go out to Mars or to the asteroids.

I also think the backside of the moon would be a wonderful place to put both a visual-type of observatory—a telescope—and also a radiotelescope, to study deep space. You could maximize the capabilities of the Hubble Space Telescope probably a hundredfold by having it on a nice stable platform like the backside of the moon. Plus, for radiotelescope purposes, it would be completely shielded from all the interference that radiotelescopes get here on earth from human activity.

A typical proposal for a manned Mars mission is that it use a bimodal nuclear thermal rocket, involving a reactor that powers both the spacecraft systems and the rocket engine. Do you think that is the best technical approach?

That certainly makes a lot of sense to me.

There's a couple of proposals on how to do that. One of them is here at Marshall Space Flight Center, and I went out and looked at it about two months ago at one of the tests that they had. It's called SAFE—safe, affordable fission engine. Basically, what I was looking at was a non-nuclear test of that system. They basically just had a heat source that was non-nuclear. But, using a heat-pipe system they

In space, no one can hear you . . . meow?

I understand your cat Paco has earned his own entry in the annals of space history. How did that come about?

I trained the Spacelab J crew. And among the crew of the Spacelab J was astronaut Mae Jemison. Mae loved cats and she loved Paco. She would come visit the house and Paco would get up in her lap. She just loved Paco.

So, while she was in orbit, one of the crew members had a tape recording of his dog, and he played it all the time. He was on a different shift from Mae, and we heard that she was having trouble sleeping because he was playing his dog recording all the time.

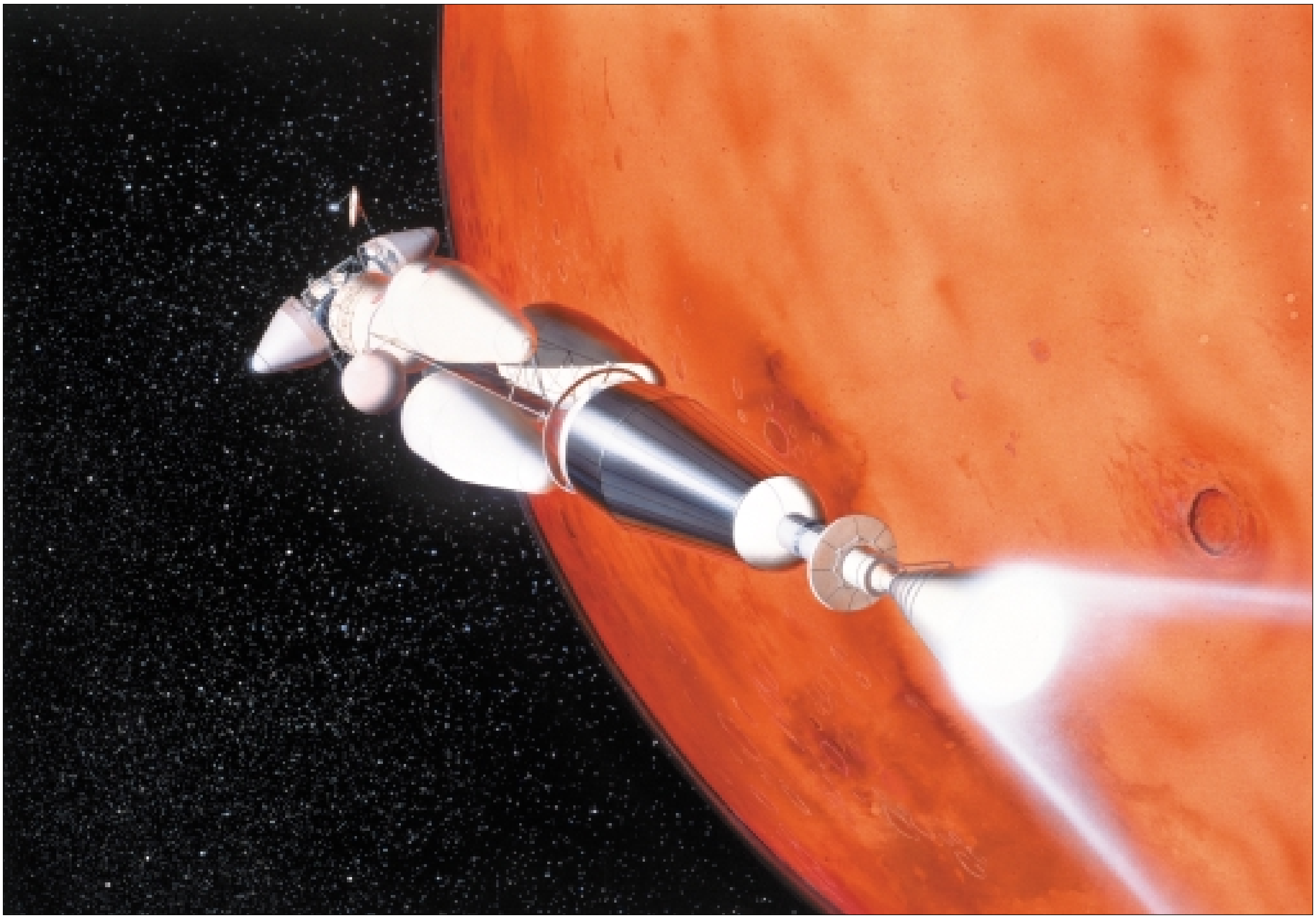
I decided that Mae needed a little boost in her morale. So, I took Paco to payload control. And, Paco will meow—you just pet him a little bit and he'll start meowing; he loves to meow. And I put him on the air. I called Mae up and said, "Hey, we've had a demand for equal time here. And this one's for you." And Paco went, "Meow-meow-meow-meow-meow-meow." He did it for about a minute. And I figured that they'd come drag me away. But it was late at night and I guess everybody was tired.

So, we did that, and it made Mae real happy. She told me, later, after the mission, that it really boosted her morale quite a lot.

And the next day, instead of the police coming and getting me, public affairs came to me and said, "We've looked it up, and as far as we can tell, Paco is the first cat to meow in space."

You weren't aware of that at the time?

No, I didn't intend to make history, I was just trying to boost Mae's morale a little bit. So, if I'm a celebrity in this town it's primarily because I own Paco.



Artist's concept, done in 1995, of a nuclear thermal rocket firing upon arrival in the vicinity of Mars to insert a transfer vehicle into orbit. Nuclear propulsion can shorten interplanetary trip times and can reduce the mass launched from Earth. As the primary transfer propulsion system, the spacecraft's reactor would remain inactive until departure from Earth orbit. (Image created for NASA by Patrick Rawlings of SAIC)

were showing where it works to provide electrical power, as well as, ultimately, propulsion power. But, their first proposal to use SAFE is for electrical power.

In other words, if you've got some deep probe going out to Pluto, once you get past Mars, essentially, the solar panels are of some value, but not much. Because by then the sun's energy is so weak, solar panels have difficulty working. So, you need another alternative power source. This SAFE engine looks like a really good one, and the results of their non-nuclear test look very good. So, it would just be a matter of hooking a reactor up to their system to make it work.

My understanding is that right now the SAFE is out at the Jet Propulsion Laboratory for some more tests. And they hope to be able to use it for either a Pluto robotics mission or one of the later Mars missions.

And one of the things that Marshall is trying to get approved is a propulsion laboratory here that would allow the NASA scientists to have a place where they can better test some of these advanced systems. Right now, they're basically working in a bunch of very old facilities that were used to build the Saturn V back in the 1960s. They could use some more modern facilities to work with.

The two traditional nuclear space propulsion technologies—nuclear thermal and nuclear electric propulsion—are suited to different types of missions. What are the advantages of each?

The fission electric propulsion is a system that would be used primarily for the long duration, robotic-type flights, where time is not particularly important. You have an architecture that gives you lots of power. With the electrical propulsion system, it slowly gets up to velocity. It slowly accelerates. But, over a period of time, it gets into some very high velocities. That's good for robotics flights, but not particularly good for human space flight, just because of all the time it takes to build up to velocity.

For that [human flights] you'd need the nuclear thermal rocket. That has high-thrust and a really big specific impulse that allows you to accelerate rapidly up to the velocity that you want.

Theoretically, you could accelerate halfway to Mars, and then turn around and decelerate the rest of the way, and that would give you an artificial gravity. The astronauts look like they're having a good time at zero G, and I know that they do, but it is not good for the human body, no matter what is said or done. That is the one result that the Russians got from Mir and we got from some of our longer duration flights, is that the loss of calcium and other minerals in the bone is not good. Plus, the muscles atrophy.

So, if you can apply any kind of gravitational system—it doesn't have to be 1 G; one-sixth G would probably be just fine. But, you need something so that your body doesn't start throwing off what it thinks it doesn't need, such as minerals out of the bone.

Which system do you think will be used first?

I think the electric system will probably be used first. Of course, the Russians have been using them for years on some of their spacecraft. So, they have some good experience with it. It's my understanding that we've got an opportunity to study those space reactors that the Russians have built. They apparently built some pretty good hardware, and I'm sure we're using some of their technology to apply to some of our designs.

Do you think we should work with the Russians?

Yes, I think we should work with anybody that's willing to work with us. I think the Russians are better, however, to work with as contractors. They're pretty well broke over there, and to try to bring them into a partnership where they have to spend their own money is very difficult for them. For national pride, they might sign up to do that. But when it comes down to actually doing it they have some difficulty.

I think the best thing that we could do is to work with Russian companies—work with the company that built that nuclear reactor. And simply buy one from them. And buy the expertise. They would be much more grateful I think. It certainly causes a lot less confusion than us trying to pretend that they're our equal when it comes to having money to spend on space, and give them some much-needed hard currency. And we get value and they get value.

Would any developments in nuclear space technology affect your work if you were beginning at NASA today instead of 20 years ago?

Well, I don't know. I think that in the first place, nuclear technology was quite advanced back in the '60s. It just got stopped for political reasons or for whatever reasons—I'm not sure why they stopped it. I just think that history has to evolve the way history's going to evolve. You can't really change that in any way. Certainly, I think that NASA would have been tickled pink if the next thing after the Apollo program was to build a Big Bad Nuclear Rocket. I'm sure we would have people walking around on Mars if we had gone that route. And it would have been a thousand times cheaper, in the long run, if we had taken that step rather than keep tweaking chemical rocket systems, like we do now.

Our chemical rocket systems are about as efficient as they're going to get. What we're basically doing now is trying to lighten up our spacecraft as much as we can using composite materials, using computer systems rather than heavy mechanical systems for guidance and control and navigation and piloting. We basically ended up building real fragile spacecraft so that the rocket systems can accelerate faster and get going faster where they're going to go. But, you can only do that for so long, and then you start running up against reality. Composites are wonderful, but they hardly are yet a substitute for aluminum and steel.

So, until we do reach that, which I don't know that we ever will, we have to build our spacecraft out of aluminum and steel, and therefore we need the propulsion systems that'll move that aluminum and steel across the solar system. And right now, the only viable candidate for that is nuclear systems.

You mentioned that you train astronauts. Have you ever been in space?

No, I haven't been in space. My career track took me in a different direction. Most astronauts come in to be astronauts. They apply to the program down in Houston. They don't ordinarily come out of NASA ranks. They come from the outside. They're either test pilots or scientists and engineers. Most of them have Ph.D.s. They come out of academia or industry.

Being an astronaut was not on my radar screen when I grew up. What I wanted to do was be like Dr. Wernher von Braun. I wanted to work on a variety of different space programs. And that's what I ended up doing.

But, when I started training astronauts, a little light bulb went on in my head, and I thought, "Hey, I can do this. It's not that hard." And I tried to convince NASA of that, but somehow they never got around to it.

But, people are always asking me if I'm disappointed that I never went into space. And my response to that is, well, I'm not dead yet.

So, it might happen?

It could happen. I'm hoping that somebody in NASA or the government will suddenly wake up one day and say, "You know what would be great publicity for NASA? We should send Homer Hickam into space." I'm just waiting for that phone call [laughs].

How did you come to write Rocket Boys*?*

I had to be trained to be an engineer, and I had to work real hard at it. But, writing always came natural to me. I had a third-grade teacher who told me that someday I was going to make my career as a writer, and she was really disappointed when she heard I was going to be an engineer [laughs].

But, I had twin passions in life. One passion was to work for NASA, and the other passion was to be a writer. So, when I came back from Vietnam in 1968, I started freelance writing at that time. I wrote for lots of different kinds of magazines—always on the side, as a freelancer. I became a scuba instructor in 1973, and I started writing for a lot of scuba-diving magazines, too. And, especially, about wreck-diving, which ultimately led into my doing the research on all of the wrecks that are off our east coast that went down during World War II, sunk by German U-boats. That ultimately became the book *Torpedo Junction,* which came out in 1989. I wasn't working on any other book because I was really busy with my NASA career. But, I was freelance writing for a number of magazines, including Smithsonian's *Air & Space* magazine.

And, in 1994, I got a call from the editor of *Air & Space* magazine, who desperately needed 2000 words. She needed a filler for the magazine, and gave me a call and said, "Do you have anything you're working on that's about 2000 words long? I need it, and I need it tomorrow." I said, "Well, no." But, I looked over and I had one little artifact left from my days as a rocket boy, and that was a steel rocket nozzle I'd been using as a paperweight. And I looked over at that, it just clicked in my mind. I said, "You know, when I was a boy back in Coalwood, West Virginia, I had a group of boys and we used to build rockets. I could write you 2000 words on that." And she was really underwhelmed at this idea.

But, I said, "That's all I got." She said, "All right, all right. Well, give me what you can." And I wrote it in about an hour-and-a-half, 2000 words, and then faxed it up to her.

I'd forgotten most of the stuff in it, but it all just came back, just like a flood, down to every detail. It just amazed me that I could remember all that stuff.

But, I didn't at first. I just gave her the highlights of the story, basically, and shipped it all up. And she called back the next day, and she said, "Homer, you've got something here. Half my office is laughing at your article, and the other half is crying. This is really something special. Do you have any pictures? Do you still have that science fair medal?" And I did. So, I shipped it all up to her.

And when the article came out a couple of months later my phone started ringing, and, in a lot of ways, it hasn't stopped ringing since. Publishers called. They wanted to know how far along I was on the book. And I said, "Well, I'm on the first chapter [laughs]." And Hollywood started to call, too. They had read it out there and it just seemed to them to be something that was pretty unique and fresh and new. I was the last person to see the value of the story.

I started getting calls, mostly from small producers, who of course wanted me to sign on the dotted line "right now." But, my first book, *Torpedo Junction,* had gotten some interest in Hollywood, so I'd become friends with a major producer out there. I called him and he introduced me to an agent who said, "Don't sign with anybody. We're going to sell this to a major studio," which he did.

I was still writing the book, and we signed the contract with Universal Studios. They had seen a draft of the manuscript, as far as I had gotten. And, then the literary agent up in New York put the book up for auction. And that was fun. I was just absolutely stunned and amazed that all this was happening, as you can well imagine.

And, I had always planned, though, to retire from NASA when I was 55 and had a 30-year federal career. And that was in February of 1998—on my birthday, February the 19th, which was also the first day they started shooting *October Sky.* So, there's something going on here. I'm not sure what it is, but there's something going on here [laughs].

I retired from NASA and basically started a full-time writing career. I've written several books since then. And, I don't really consult with NASA, but occasionally I get calls out at Marshall. And they want me to come out and look at something. And, when I can, I do. It's a lot of fun to go out there and renew old friendships, but just also to see some of the neat stuff that they're doing, like this SAFE engine.

Will you continue to write both fiction and nonfiction?

Both, yes. The next book out is called *Sky of Stone,* a sequel to *Rocket Boys,* which will be out this October. But, the book that I'm working on right now is called *Hatteras,* at least that's the working title, and it goes back to my first book, *Torpedo Junction.* It's a novel about the battle against the U-boats on the east coast during World War II.

So, I like to be eclectic. I'm going to try to do a little bit of this, a little bit of that.

Back to the Moon, the third book [a novel] that came out after *Rocket Boys,* has been optioned by Hollywood. And we have some hope that it will actually be made. So, that would be kind of neat. I should have used a nuclear rocket in that one.

Put that in your next one.

Next one, that's right. NN